THE YEAR BOOK *of* ORTHOPEDICS *and* TRAUMATIC SURGERY

(*1956-1957* YEAR BOOK *Series*)

EDITED BY

EDWARD L. COMPERE, M.D., F.A.C.S. F.I.C.S.

Professor and Chairman Department of Orthopedic Surgery Northwestern University Medical School Chairman Department of Orthopedic Surgery Chicago Wesley Memorial Hospital Consultant in Orthopedic Surgery Augustana and Henrotin Hospitals Senior Consultant in Orthopedic Surgery Veterans Administration Research Hospitals

THE YEAR BOOK PUBLISHERS

INCORPORATED

200 EAST ILLINOIS STREET

CHICAGO 11

THE PRACTICAL MEDICINE YEAR BOOKS

This volume is one of the 13 comprising the Practical Medicine Series of Year Books founded in 1900 by G P Head, M.D., and C J Head, and published continuously since then. The complete list follows

Medicine: *Infections*, edited by PAUL B BEESON M.D *The Chest*, by CARL MUSCHENHEIM M.D *The Blood and Blood Forming Organs*, by WILLIAM B CASTLE, M.D *The Heart and Blood Vessels and Kidney* by TINSLEY R. HARRISON M.D. *The Digestive System*, by FRANZ J INGELFINGER, M.D *Metabolism*, by PHILIP K. BONDY M.D

General Surgery edited by EVARTS A. GRAHAM, M.D., with a section on *Anesthesia*, by STUART C. CULLEN M.D

Drug Therapy edited by HARRY BECKMAN M.D

Obstetrics & Gynecology edited by J P GREENHILL, M.D

Pediatrics edited by SYDNEY S. GELLIS, M.D

Radiology: *Diagnosis*, edited by JOHN FLOYD HOLT M.D., and FRED JENNER HODGES, M.D *Radiotherapeutics* by HAROLD W JACOX, M.D., and MORTON M. KLIGERMAN M.D

Eye, Ear, Nose & Throat: *The Eye* edited by DERRICK VAIL, M.D *The Ear Nose & Throat*, by JOHN R. LINDSAY M.D

Neurology Psychiatry & Neurosurgery: *Neurology* edited by ROLAND P MACKAY M.D *Psychiatry* by S. BERNARD WORTIS, M.D *Neurosurgery* by OSCAR SUGAR, M D

Dermatology & Syphilology edited by RUDOLF L. BAER, M.D., and VICTOR H. WITTEN M.D

Urology edited by WILLIAM W SCOTT M.D

Orthopedics and Traumatic Surgery edited by EDWARD L. COMPERE, M.D

Endocrinology edited by GILBERT S. GORDAN, M.D

Pathology and Clinical Pathology edited by WILLIAM H. WARTMAN M.D

Dentistry: *Oral Pathology & Oral Medicine*, edited by HAMILTON B. G ROBINSON D.D.S. *Operative Dentistry* by DONALD A. KEYS, D.D.S. *Oral Surgery* by CARL W WALDRON M.D., D.D.S., *Prosthetics*, by STANLEY D TYLMAN, D.D.S., M.S., *Orthodontics*, by HAROLD J NOYES, D.D.S.; *Public Health*, by JOHN W KNUTSON

TABLE OF CONTENTS

PUBLISHER'S NOTE The designation (Series 1956-1957) used on the cover and title page of this volume is to indicate its publication during the "series year" which begins September 1956 with the publication of the YEAR BOOK OF MEDICINE and ends in May 1957 with the YEAR BOOK OF PATHOLOGY AND CLINICAL PATHOLOGY

The articles abstracted herein are taken from journals received between November 1955 and November 1956.

INTRODUCTION

A growing interest in the diseases or disabilities of the older patient is making Geriatrics a subject which must be studied by every orthopedic surgeon who wishes to be well informed It is predicted that the number of papers which have to do with orthopedic problems of elderly patients will increase during each of the next few years For these reasons a chapter on Geriatrics has been added to this YEAR BOOK

Osteoporosis of the spine and other bones of patients more than 60 years of age is common and may be a primary cause of backache and of spontaneous fractures of the spine or the hip Although there may be many contributing causes for the osteoporosis of the elderly patient disturbance of protein metabolism is nearly always one of the most important factors This is not a primary disturbance of calcium or phosphorus metabolism as it was erroneously thought to be until comparatively recent years Agreement has not been reached with regard to the best diet or the most effective supplements of hormones or vitamins for preventing or treating osteoporosis

Although the treatment of fractures of the spine and extremities has become better understood and the technics for management of these injuries are more effective than were those of a few generations ago nonunions or delayed unions *still occur These produce prolonged disability for the patient* and distress for the treating physician The principal cause of nonunion is *not* inadequate *immobilization* as is so often stated in many textbooks Persistent distraction of the fracture fragments by too much traction or by means of rigid fixation which keeps the fracture fragments apart produces most nonunions The surgeon who tries to make up for his own technical deficiency or for his lack of appreciation of the need for continued slight compression between the fracture surfaces by feeding the patient large amounts of calcium or massive doses of vitamin D is doomed to disappointment and his patients to greater disability The use of more calcium than can be absorbed and utilized from an

adequate diet or of massive doses of vitamin D may interfere with absorption from the intestinal tract or produce toxicity causing interference with the fracture healing

Open surgery which is not necessary in order to obtain satisfactory reduction and fixation of the fragments permits the escape of the most important primary element in the healing of the fracture which is the blood clot about the ends of the fracture fragments If in addition bacterial organisms are introduced delayed union nonunion or loss of the limb may be anticipated. The surgeon who finds it necessary to open a fracture, whether it is recent or of long standing can minimize the danger of delayed union or nonunion if he takes advantage of the opportunity afforded him of placing across the fracture line multiple small shavings of autogenous bone These small bone grafts can be obtained from the fracture bones themselves adjacent to the fracture They may be expected to promote callus formation leading to early union and to reduce greatly the danger of nonunion

The controversy which has been going on for the past several years with regard to the relative effectiveness of homogenous heterogenous or autogenous bone grafts would seem to have been resolved in favor of the autogenous graft Cultured calf bone has been shown to produce healing of a fracture or fusion of a spine in many instances Failure however of this type of bone to take or to be transformed into living bone nourished by the circulation of the host has also been observed in many cases If autogenous bone is available it should be used either alone or in combination with bone obtained from other patients of the same species Heterogenous bone is most useful as a supplement to not as a substitute for the autogenous graft.

The misuse of antibiotics has constituted a subject for many lectures and some articles which appeared in the medical press during the past year The authors conclude that antibiotics should be used where there is reason to anticipate infection or where infection is definitely already present The use of an antibiotic, or of multiple antibiotics as a prophylactic measure before and after surgery in which there has not been any break in technic or any reason to anticipate infection is not recommended An ever increasing number

of patients have become allergic to one or more antibiotics Serious gastrointestinal complications are being reported with increasing frequency as the result of unwise and often quite unnecessary administration of antibiotics

—Edward L. Compere.

ANATOMY EMBRYOLOGY PHYSIOLOGY AND PATHOLOGY

Anatomy of Lumbosacral Posterior Rami and Meningeal Branches of Spinal Nerves (Sinovertebral Nerves) With Experimental Study of Their Functions. Herbert E Pedersen, Conrad F J Blunck and Ernest Gardner[1] (Wayne Univ) determined the distribution of the lumbosacral posterior rami and sinovertebral branches (ramus meningeus) of spinal nerves by dissection of newborn and adult cadavers and by study of serial sections of human fetuses In addition blood pressure and respiration were recorded and electromyograms made in decerebrate cats during electric and mechanical stimulation of low back structures

The posterior rami besides their cutaneous and muscular distribution give sensory fibers to fascia ligaments periosteum and intervertebral joints Adjacent divisions overlap in the area of supply Interspinous ligaments are supplied mainly by branches from the next cranial level Sinovertebral nerves supply posterior longitudinal ligament dura mater periosteum and blood vessels show intersegmental anastomoses and contain sensory fibers

Painful stimulation of joints and ligaments of the lumbosacral region in cats produces reflex spasm of dorsal and hamstring muscles and nonspecific changes in respiration and blood pressure The authors suggest that clinically a painful stimulus to any deep structure in this region is poorly localized and can give rise to a common symptom complex which includes low back and leg pain

Stilwell demonstrated that gross distribution of these nerves in the monkey is similar to that here described He *found overlap of adjacent segments, free nerve endings* (presumably pain) in such structures as joint capsules and posterior longitudinal ligament and proprioceptive endings in the capsules of the posterior joints

Ischiopubic Synchondrosis in Healthy Children Some Normal Roentgenologic Findings are reported by John Caf-

(1) J Bone & Joint Surg 38-A:377-391 April, 1956.

fey and Steven E Ross* (New York) The ischiopubic synchondrosis is a fixed joint binding the distal end of the inferior pubic ramus to the distal end of the inferior ischial ramus before the two bones fuse in late childhood (Fig 1) X rays of the pelvis in 549 healthy children aged 2 12 revealed that fusion of the ischial and pubic rami occurs at all ages between 4 and 12 and in a small percentage even after this age About one fourth of children complete the



Fig 1—Normal ischiopubic synchondrosis at different ages: *A* in infant aged 2 days *B* at 12 months *C* at 2½ years; *D* at 6½ years after completed fusion of ischial and pubic rami. (Courtesy of Caffey J and Ross, S. E.: Am. J Roentgenol. 76 488-494 September 1956.)

process by age 7 about one-half show bilateral fusion at age 9 and about three fourths at age 11

Bony swelling at the ischiopubic synchondrosis precedes fusion in many children and persists for several years before fusion occurs The swelling can be regarded as part of the normal growth process Swelling and uneven mineralization at the ischiopubic synchondrosis are not in themselves indications of disease. The high incidence of these findings in healthy children suggests that ischiopubic osteochondritis (Van Neck s disease) usually diagnosed on the basis of similar x ray findings is exceedingly rare. Probably many of the supposed examples of this disease represent normal variations in healthy children

(2) Am. J Roentgenol. 76:488-494 September 1956.

Bone Salt Formation Measured in Infants by Means of P^{32} Göran C H Bauer Arvid Carlsson and Bertil Lindquist[3] present the technic used in four children for determining in vivo the accretion rate of bone salt They had previously demonstrated that in animals the isotope technic permits accurate determinations of the rates of new formation (accretion) and resorption of the bone salt. The exchange reactions between the bone salt crystals and the blood can also be studied quantitatively

TECHNIC.—To a physiologic saline solution, $H_3P^{32}O_4$ of a high specific activity and Na_2HPO_4 were added until the P content of the solution was about 7 mg/100 ml Each child received an intramuscular injection of 1 2 ml of this solution. In several blood and urine samples radioactivity and inorganic phosphorus were determined. Two bone specimens were taken from each child, the first from the left and the second from the right tibia about 7 and 16 days after administration of P^{32} The specimens were ashed and examined for radioactivity and content of Ca and P

In the proximal part of the tibia shafts in normal infants (two) values for accretion rate were 0 016 and 0 011 expressed as mg P/day/mg P of sample corresponding to about 0 05%/hour

The percentage net increase in inorganic phosphorus in the skeleton must be the same as the percentage net increase in calcium of the whole body because all calcium of the body is contained in the skeleton and the bone salt Ca/P ratio is practically constant If on the average a child contains 20 Gm calcium at birth and gains about 0.2 Gm calcium/day the net increase in calcium at age 1 may be calculated to be about 0 01%/hour Thus the net increase constitutes a fifth of the accretion rate This proportion of net increase to accretion in the proximal part of the tibia shafts in normal infants is of the same order as that observed in the tibia of young rats In accordance with the fact that percentage increase in body weight drops with age the highest accretion value was found in the youngest child

Influence of Arteriovenous Fistula on Fracture Healing Experimental Study Emer W Johnson Jr., and John A Henrie[4] studied the effect of experimentally produced arteriovenous fistulas on rate of bone healing of fractures in

(3) Acta paediat. 44 477-486 September 1955
(4) Proc. Staff Meet. Mayo Clin 31 276-278 May 2, 1956.

the femur of the dog In four dogs a fracture of the mid shaft of the femur was produced by using a transverse fracture line and subsequently stabilizing this fracture by two intramedullary Kirschner wires No other fixation of the fracture was used The fixation effectively controlled lateral and bending motions but did not adequately control rotation A week later a left arteriovenous fistula was established in the external iliac vessels in each animal

Callus formation was apparent subperiosteally and distally from the fracture line by the second week in both control and experimental animals The study suggests that the amount and rate of callus formation after experimentally induced fractures in dogs is little affected by presence of arteriovenous fistula in the same leg proximal to the fracture In isolated instances more rapid production of callus of greater density was observed in the experimental group than in the controls when followed by x rays at weekly intervals but this could not be made into any sort of rule.

Effect of Anticoagulant Therapy on Bone Repair Frank E Stinchfield Balu Sankaran and Robert Samilson[5] (New York) noted development of pseudarthroses in four patients who had received anticoagulant therapy for thrombophlebitis immediately after surgery A controlled study in which 26 experimental and 26 control animals were used was undertaken to determine possibility of a causal relation between anticoagulants and poor bone healing

In control rabbits bony union occurred in four weeks in control dogs in six weeks When the animals received anticoagulants in the preoperative period or one week postoperatively delayed union occurred. When anticoagulants were given immediately after operation fibrous union resulted Though heparin and dicumarol[*] affect blood coagulation in entirely different manners they have a parallel effect on bony healing

The effect of anticoagulants may be mechanical i e lack of scaffolding in the form of the fibrin clot on which the osteoblasts form bone or due to the toxic effect of the anticoagulants cellular i e., definite diminution in the number of cells at the graft site or alteration in the normal metabolic process in the bone matrix.

(5) J Bone & Joint Surg. 38-A 270 282, April, 1956.

Mechanisms of Skeletal Muscle Pain and Fatigue were studied in a group of 10 normal subjects by Theodore L. Dorpat and Thomas H Holmes[6] (Univ of Washington)

METHOD—Skeletal muscle contractions were performed by squeezing with the fingers a rubber bulb attached to a mercury manometer The level to which the mercury was raised was termed "contraction strength." A strong contraction of 11 cm. Hg was employed most commonly Muscle temperature was measured by copper-constantin thermocouples inserted to a depth of 20 mm. in forearm flexor muscles Results were considered indicative of blood flow in some experiments Circulation to the arm was occluded by a blood pressure cuff inflated to 200 mm. Hg "Pain threshold" was the time required for pain to appear in a given contraction, and pain intensity was subjectively measured on a 1 10 scale.

Both strong rhythmic and sustained contractions performed with blood flow intact produced pain indistinguishable from ischemic muscle pain produced by occlusion of circulation Under conditions of intact blood flow weakly contracted muscle received more blood than strongly contracted muscle. The pain threshold appeared to be a function of contraction strength and muscle blood flow being less with weak contractions and greater flow than with strong contractions and less flow Experiments with immersion of the arm in hot or cold water (to alter blood flow) confirmed the findings of a barrier to muscle blood flow produced by sustained contractions Obstruction to blood flow by arterial or venous occlusion promoted appearance of pain in the contracting muscle

Development of muscle fatigue paralleled genesis of pain This dual response precludes prolonged sustained contractions The postcontraction recovery periods of skeletal muscle from pain and fatigue ran a similar course and recovery rate was roughly proportional to magnitude of blood flow

The authors postulate that during the relative ischemia which accompanies contracting skeletal muscles noxious metabolites (factor P of Lewis) are produced capable of engendering pain Accumulation of these substances in concentrations sufficient to exceed the pain threshold depends on form intensity and duration of contraction

Immunologic Factors in Homogenous Bone Transplantation II Histologic Studies Serologic studies on immunologic factors in homogenous bone transplantation have

(6) A M A. Arch Neurol. & Psychiat. 74 628-640 December 1955

shown that though transplanted dog bone or its contained cellular elements appeared to act as an antigen no relation between that antigen and the blood type of the donor dog could be established with certainty Paul H Curtiss Jr., Samuel W Chase and Charles H Herndon[7] (Cleveland) performed bone grafts on A negative dogs with anti A agglutinins to ascertain if histologic evidence could show such relation The dogs were killed at regular intervals and the recovered grafts and adjoining sections of host bone were studied microscopically

The histologic findings did not suggest that a known blood group antigen antibody antagonism (A and anti A) has any demonstrable effect on the fate of an iliac bone graft Autogenous grafts showed consistently better response to grafting than did compatible or incompatible homogenous bone grafts

Medicamentous Influence on Bone Healing was evaluated by Georg Salem and Erwin Simandl[8] (Univ of Vienna) in 120 patients with fracture treated by ossopan (Robapharm Basel) in most instances given prophylactically to prevent delayed union severe atrophy and necrosis of the femoral head after nailing of medial fractures of the neck of the femur There were 12 open fractures of the lower leg 15 fractures of the radius with severe osteoporosis 32 nailed medial femoral neck fractures 2 isolated tibial fractures 3 breaks of the lower arm and 3 of the radial shaft. In 23 femoral fractures in aged patients no definite effect could be demonstrated Ossopan was also used as treatment in 22 cases of Sudeck s atrophy 3 pseudarthroses 2 chronic fractures and 3 necrotic heads after nailing of femoral fractures with great success

Woman, 69, underwent reduction and nailing of medial fracture of the femoral neck, Pauwels type II. X ray showed the nail point in the lower dorsal quadrant, 8 mm. from the cortex 11 months later the fracture line was definitely demonstrable and showed beginning resorption with signs suggesting pseudarthrosis (Fig 2) Later a fistula, the thickness of a pencil and extending to the head of the nail, had to be excised, and the nail was also removed Despite bed rest, the fracture showed no x ray improvement two years after original nailing From this time she received 2 ossopan pills three times

(7) J Bone & Joint Surg 38-A 324-328, April, 1956.
(8) Arch orthop. u. Unfall-Chir 48 63-74 1956.

daily and after three months definite healing was evident (Fig 3) Aside from a slight limp due to shortening she was symptom free.

Use of the drug in isolated cases of osteoclastic bone metastases produced no definite results It was also tried in some cases of Schlatter s disease fractured bone cysts etc.

Without doubt ossopan prepared from the bones of young animals provides an ideal source of minerals in which organic bone substances are important though their

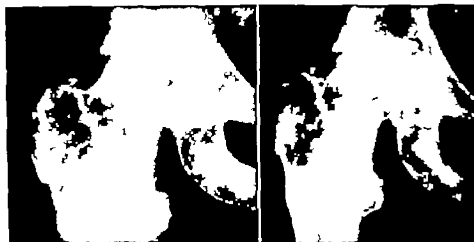


Fig 2 (left) —Beginning pseudarthrosis of femoral neck.
Fig 3 (right) —Three months later note bony healing
(Courtesy of Salem, G., and Simandl, E. Arch. orthop. u. Unfall-Chir 48:63-74 1956.)

exact nature and functional effect have not yet been established Prophylactic medication with ossopan is recommended especially in cases in which delayed union is anticipated

Study of Recorded Noise in Normal and Pathologic Knee Joints of Human Subjects is presented by John Hunter and H C Brooks[9] (Toronto) Good correlation was found between clinical diagnoses and abnormal sounds A microphone was taped to the knee joint and responses were transmitted through an amplifier and oscilloscope with final total amplification of 7 000 times The microphone was taped alternately on the medial and lateral aspects of the right and left knees The subjects were

(9) J Lab. & Clin. Med. 47:289-276, February 1956.

supported in a frame and their weight counterbalanced with half the body weight and a 10 lb counterweight. Degree of flexion was determined by goniometry of sequential photographs of the knee in action

Of the 27 subjects, 11 adults and 2 children all normal produced essentially noiseless records Two adults previously thought to be normal had noisy records and traumatic arthritis of the knee was demonstrated in one and osteoarthritis of the spine in the other One child had a noisy record for no apparent reason Two patients with osteoarthritis of the knees gave noisy records One of these had unilateral complaints which corresponded well with unilateral noises One patient with diagnosis of osteoarthritis had a normal record and was subsequently considered to have a psychiatric disorder with no evidence of arthritis

Four patients with rheumatoid arthritis had noisy records one with clinical rheumatoid arthritis had a normal record Another patient recovered from rheumatoid arthritis had a normal record One with subacute rheumatoid arthritis in remission and one who had recovered from traumatic arthritis had no demonstrable noises

The method supplements clinical examination by allowing production of objective and permanent records The apparatus can be made by a relatively inexpensive addition to standard ECG models

Arthrokinetic Reflex of the Knee *The knee joint* proprioceptors can serve two major functions They can fire into higher centers where they may produce an awareness of specific movements and positions and/or they may produce subconscious reflex effects Leonard A Cohen and Manfred L Cohen[1] (Univ of Pittsburgh) attempted to determine whether the activation of knee joint proprioceptors is capable of producing reflex responses

The knee joint of decerebrate cats was rotated through a full range of flexion extension movements The tensions of the quadriceps femoris and semitendinosus muscles were recorded and the responses of the muscles to joint movement studied The medial and posterior articular nerves were later sectioned and control records taken Flexion of

(1) Am J Physiol 184 433-437 February 1956.

the knee decreased tension of the quadriceps femoris but increased that of the semitendinosus Re-extension of the knee restored both tensions to resting values These responses were reflex in nature. Since the knee joint reflex is basically a slow adapting movement reflex, the name arthrokinetic reflex is suggested The activity of the arthrokinetic reflex indicates that its general function is to co-ordinate knee movement with other nervous activity in thigh muscles In addition it appears to have specific orientation toward dealing with the powerful stretch reflex of the quadriceps femoris muscle.

Radiation Pain Threshold in Relation to Skin Temperatures was studied by J W Beattie and A Woodmansey[2] (Leeds) by modification of the thermal radiation method of pain stimulation with fixed intensity and variable exposure times The study was concerned with the pain perception threshold as represented by the verbal report of pain and not the pain reaction threshold or the maximal tolerance. Changes in the apparent radiation pain threshold were inversely related to alterations in the skin temperature of the area. Significant interpersonal and day to-day differences in the actual pain threshold with observed Aspirin amphetamine or antihistamines did not seem to elevate the actual radiation pain threshold Only morphine showed an analgesic effect Deep pain analgesic efficiency could not be correlated with effects on the actual radiation pain threshold No significant difference was found between the range of actual skin radiation pain thresholds in the rheumatoid arthritis patients and in the normal subjects

Elevation of Serum Acid Phosphatase in Gaucher's Disease was observed by Lester R Tuchman Harry Suna and Julius J Carr[3] in eight patients Metastatic neoplasm was readily ruled out Alkaline phosphatase determinations done in three were normal Decrease in percentage of phosphatides in the spleen and liver in Gaucher's disease has been described Whether this decrease in phosphorus containing lipid can be related to an increase in serum acid phosphatase levels remains to be determined

(2) Ann Rheumat Dis 14 397-403, December 1955
(3) J Mt Sinai Hosp 23 227-229 Ma Apr 1956

Fat Embolism—*I Amount of fat in human long bones*—Leonard F Peltier[4] (Univ of Minnesota) determined the total amount of fat contained in human long bones by extracting the entire bone with alcohol and ether The amount varied considerably among individuals This variation is a function of the size of the bone and its mineral content Although the size is determined by genetic and dietary factors the mineral content fluctuates throughout lifetime Function with its concomitant stress and strain increases mineral and decreases fat content Disuse or non function is associated with atrophy and decrease in mineral content The bone fat apparently serves purely as a space-occupying material and as a store of energy

Most of the bone fat was contained in the metaphysial sponge rather than the diaphysial tube The quantities were greatly in excess of those obtained by calculation previously stated in the literature

The study suggests that sufficient fat is present in the long bones to account for the phenomenon of fat embolism The author believes that the source of the emboli is the local site of injury where there is rupture of the fat cells and free fat droplets Fat emboli do not appear in the general circulation of experimental animals with fractures or in patients having operations on the bone if the site of injury is excluded from the general circulation by a tourniquet applied proximally before injury

II Chemical composition of fat obtained from human long bones and subcutaneous tissue—Leonard F Peltier (Univ of Minnesota) Donald H Wheeler Harold M Boyd and Joan Randolph Scott[5] (Gen'l Mills Res Dept., Minneapolis) found that human fat obtained from the bone subcutaneous tissue or abdominal viscera does not differ markedly in composition The fat from young adults is very similar to that from older persons This fat is almost entirely neutral Unsaturated fatty acids comprise 65-80% of the constituent acids the rest being fully saturated. Oleic acid is the most important constituent acid of human fat linoleic acid is present in small quantities and arachidonic and linolenic acids in traces

(4) Surgery 40 657-660 October 1956
(5) Ib l., pp 661-664

III Toxic properties of neutral fat and free fatty acids — Leonard F Peltier[6] having determined that the bones contain large quantities of neutral fat and that about 75% of the constituent fatty acids is unsaturated investigated the toxic properties of neutral fat and free fatty acids In fat embolism coincident with appearance of petechiae a sharp drop in hemoglobin values occurs This anemia is out of all proportion to external blood loss or to blood loss at the local site of injury At autopsy the lungs are filled not with a transudate or simple pulmonary edema but with whole blood the result of intra alveolar hemorrhage These observations suggest that the mechanical obstruction of the lung capillaries by fat emboli may be only one phase of the disturbed physiology in this condition and that the chemical action of the fat or its constituents producing disruption of the capillary bed, may represent another

Peltier found that the toxicity of neutral fats and mineral oil is a function of their viscosity Hemorrhage into the alveoli or other pericapillary tissues results This action may be due to affinity of the fatty acids for calcium ions Appearance of lungs of patients with classic findings of fat embolism closely resembles that of the lungs of animals damaged by injection of these fatty acids

Synovial Specimens Obtained by Knee Joint Punch Biopsy Histologic Study in Joint Diseases is reported by Henry A Zevely A James French William M Mikkelsen and Ivan F Duff[7] (Univ of Michigan) in 55 procedures in 49 patients with diseases of the joints

TECHNIC.—After the knee has been prepared and draped, 1½% procaine solution is injected into the skin and about the underlying structures infiltrating the joint capsule widely in the path of the instrument. The knee joint is approached through the suprapatellar bursa (Fig 4) Synovial fluid is aspirated through the hollow needle and examined. About four specimens of synovium are obtained from the perimeters of the joint space and are fixed immediately in 10% Formalin. The patients are permitted to walk immediately after the procedure but are asked to avoid unnecessary activity for 24 hours.

The procedure is somewhat limited because as the joint surfaces are not seen selection of the biopsy sites is one of chance In this study biopsy material was satisfactory in 90% The single complication occurred in a patient with

(6) Surgery 40:665-670 October 1956
(7) Am. J Med. 20:510-519 April, 1956



Fig 4—Biopsy needle and hollow inner cutting needle in place; note left index finger on superior margin of patella. (Courtesy of Zevely H A. *et al* Am. J Med. 20:510-519 April, 1956.)



Fig 5—Rheumatoid arthritis of seven years duration in man, aged 57 in stage IV (American Rheumatism Association classification) inactive; there ar heavy inflammatory cellula infiltrations including lymphocytes and plasma cells beneath synovium, reduced from ×210 (Courtesy of Zevely H A., *et al.* Am. J Med. 20.510-519 April, 1956)

rheumatoid arthritis and consisted of symptomatic hemarthrosis with increased joint pain and swelling for 48 hours The synovial alterations in rheumatoid arthritis (Fig 5) Reiter s syndrome disseminated lupus erythematosus and dermatomyositis were qualitatively so similar that synovial biopsy was not conclusive in differentiating these diseases

Urate deposits in the synovium of acute nontophaceous

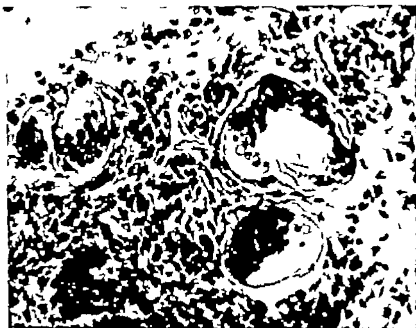


Fig. 6.—Intermittent joint symptom of 14 years duration in man, aged 59 with nontophaceous gout in asymptomatic interval urate deposits are present in giant cells beneath synovium reduced from ×500. (Courtesy of Zevely H. A., et al. Am. J Med. 20 510-519 April, 1956.)

gouty joints were found in four of six instances (Fig 6) This constituted an absolute diagnosis and settled the diagnostic problem in two patients with normal serum uric acid levels The synovial findings in neuropathic joint diseases were characteristic of these diseases particularly with respect to widespread lime salt deposits

Bone Necrosis Caused by Wiring is reported in three patients by Olof Johansson[8] (Sodersjukhuset, Stockholm)

CASE 1—Woman, 45 with spiral fracture of the tibia was operated on with two cerclage wires and leg was *immobilized.* Wei bearing was started after six weeks with immobilization in pl

(8) Acta chir scandinav 110 213- 1 1955

cast. Later leg pain with swelling and tenderness developed X rays showed pseudarthrosis. Operation with splintering of fracture ends was performed with complete union at a later date.

CASE 2.—Man 56 with spiral fracture of right tibia was treated by skeletal traction followed by encirclage operation with two wires. Plaster cast was left on for seven weeks after which weight bearing was permitted with high plaster boot. Later pain developed at fracture site. After x rays showed wires embedded deep at fracture site, they were removed. Later he reinjured the right leg while cycling and local pain developed at fracture site. Biopsy showed fibrous tissue. Immobilization in plaster was followed by complete bony union.

CASE 3—Man 32, had spiral fracture of tibia which was openly reduced with single wire around the fracture (Fig 7) Weight



Fig 7 (left) —Fracture after operation.
Fig 8 (right) —Fracture about 10 months later note distinct bone necrosis.
(Courtesy of Johansson O Acta chir scandinav 110:213-217 1955)

bearing in a short plaster boot was permitted six weeks after operation. Later pain developed in the leg on movement. X rays showed the wire deeply embedded in callus which revealed a circular break at the level of the wire (Fig 8) The wire was removed and fixation in plaster was done. Pseudarthrosis developed, necessitating a second operation

Adequate fixation is essential to bony union of a fracture From animal experiments the author concludes that catgut is not a suitable material for cerclage because of chemical action of iodine used in sterilization Cerclage if applied mechanically causes damage in the soft tissue The wires must be removed if signs of delayed union are noted Satisfactory fixation must be maintained until clinical and x ray healing occur

Ischemic Necrosis of Anterior Tibial Compartment Musculature The condition occurs infrequently and usually leads to functional impairment Roe E Campbell and Frank H Van Wagoner[9] report on three men aged 21 36 in whom ischemic necrosis of the anterior tibial compartment musculature developed without trauma or signs of arterial disease

The symptom complex in all three was similar They had progressive pain and tenderness over the anterior tibial compartment which did not respond to heat but symptomatic improvement was effected by paravertebral blocks Signs of paralysis of the muscles of the compartment followed with footdrop and inability to dorsiflex the toes Hypesthesia over the compartment and the dorsum of the foot was a consistent finding Dorsalis pedis pulsations were present in all and signs of paralysis were permanent

The first patient had a fasciotomy on the fifth day of the disease which demonstrated necrotic muscle that was still sloughing from the incision six months after the operation The second received symptomatic treatment and early physical therapy The third was in the late phase of the disease when seen and was given paravertebral blocks Final outcome was the same in all The first few hours of treatment are important Whereas rest and conservatism may be used if pain is the only symptom wide fasciotomy and paravertebral blocks must be done immediately if paralysis of these muscles has occurred

Bone Changes in Tropical Ulcer are discussed by J Scott Brown and J H Middlemiss[1] Tropical ulcers occur almost exclusively below the knee They are painful and heal slowly In early stages they are only skin deep and resemble breaking-down pustules They spread rapidly and later fascia muscles tendons and bone may become involved with profuse granulations In chronic cases malignant change may occur When healing occurs the skin scar is thin and cicatrization may cause constriction of the leg Recurrence is common

The tibia and fibula are the bones usually affected The earliest change is a fusiform periosteal reaction under the

(9) A.M.A. Arch Surg 71 662-668 November 1955
(1) Brit J Radiol [illegible] 213 217 April, 1956.

ulcer This reaction may remain localized or extend along the shaft of the bone It may have the appearance of simple new subperiosteal bone but sometimes it produces an onion peel layering and sometimes radiating spicules" which may give the impression of osteogenic sarcoma

If the ulcer heals during the early stages quite extensive bone change may resolve completely but if it becomes chronic or recurs permanent changes are established in the bone consisting of two components—the reaction under the ulcer and the reaction remote from the ulcer In the former sequestration of the cortex or further heaping up of new subperiosteal bone may occur The heaping up of new bone may eventually take on the appearance of an osteoma In the early stages the remote changes consist of a periosteal reaction As this subperiosteal bone consolidates and blends with the old cortex the latter presumably by the normal process of osteoclastic resorption is absorbed and replaced by cancellous bone the outer layer of the new subperiosteal bone remaining as the new cortex.

Deformities may occur as a result of chronic ulcers or of their healing

---

CONGENITAL DEFORMITIES

Congenital Angulations and Fractures of Extremities are discussed by E Thyge Madsen[2] (Copenhagen Univ Hosp) Angulation fracture and pseudarthrosis are various forms of the same bone lesion Most often the tibia is involved unilaterally or bilaterally but not infrequently the tibia and the fibula are affected Next in frequency is the femur often bilaterally affected In most instances there is forward angulation of the tibia with talipes equinus probably due to the pull of the powerful hamstring muscles As a rule angulation is not very marked at first and the tibia is only moderately curved A fracture may be present at birth but most often it is not observed

(2) Acta orthop. scandina 25 242 280 1956.

until the infant starts standing or walking The pseudarthrotic tibia is considerably shortened the fracture is completely loose and the distal parts or the whole leg becomes atrophied (Fig 9) The affected femur is considerably bent at birth as a rule in the upper third of the shaft but sometimes in the lower third There may be marked shortening and a tendency to dislocation of the hip Limping



Fig. 9.—Congenital pseudarthrosis of right lower leg. Anterior angulation was noticed at 14 months and fracture occurred at 5 years, with subsequent pseudarthrosis. At age 12, there are anterior angulation at distal third of tibia and fibula, pointed ends, marked over riding and 7 cm. shortening. (Courtesy of Madsen, E. T.: Acta orthop. scandinav. 25:242-250, 1956.)

and scoliosis are extreme if the lesion is not treated X ray examination is the only reliable method of confirming the clinical diagnosis Defective ossification involving a large area of the diaphysis would explain why congenital fractures heal so badly or recur so often whereas traumatic fractures in infancy show such remarkably rapid healing



Fig. 10 —Same case as that shown i Figure 9 after operation two months later using Vitallium plate and four screws. After six weeks, anterior angulation was again noticed and there were no signs of healing (Courtesy of Madsen, E. T Acta orthop. scandinav 25:242 280 1956.)

and even fractures due to localized tumors unite solidly as soon as the tumor has been surgically removed

Under age 7 manipulative reduction and immobilization are advised Surgery at a later time should aim at complete substitution of defective bone tissue by autografts of healthy bone However even autografts may fail (Figs 10 and 11) Subsequent immobilization in plaster casts and caliper braces must be continued under frequent x ray study for many months until solid union is established in lesions of the lower leg Corrective osteotomy may be nec essary in angulations of the femur and the forearm



Fig. 11.—Completely unsuccessful result, with fracture of graft, bayonet-shaped axis, marked pes calcaneus and 8 cm. shortening. Bone structure is pathologic, with thin cortex and transverse lines through diaphysis, bone ends are sclerotic, medullary canal is closed and there is no healing. Amputation was performed 2½ years later. (Courtesy of Madsen, E. T.: Acta orthop. scandinav. 25:242-280, 1956.)

Diagnosis of Congenital Dysplasia of Hip in Newborn Infant. Sherman S. Coleman[5] (Primary Children's Hosp., Salt Lake City) suggests the following criteria for diagnosis of congenital hip dysplasia in the newborn infant: (1) lateral or posterolateral manual displaceability of the femoral head (jerk of exit) with an otherwise normal pelvic x-ray; (2) an acetabular index of 40 degrees or more without demonstrable displaceability of the hip; (3) lateral disposition of the femoral neck by x-ray examination in the absence of demonstrable displaceability of the hip and with

(5) J.A.M.A. 162:548-554, Oct. 6, 1956.

or without an elevated acetabular index (4) persistent and unequivocal limited abduction of the flexed thigh with or without abnormal x ray changes or (5) any combination of these

Actual dislocation of the hip with the femoral head lying *completely out of the acetabulum seldom exists* at birth It develops as a gradual process that should be watched for throughout the first year of life in every child *Coleman investigated the possibility of recognizing at*

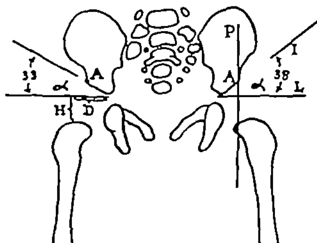


Fig 12.—Drawing from x ray of pelvis of newborn infant (hips normal on physical examination) *A* indicates anterior-superior iliac spine; *L* is horizontal line of Hilgenreiner drawn through comparable points on triradiate cartilage, *I I* line drawn parallel to acetabular roof angle formed between *I* and *L* is acetabular index, at *P* is Perkins line, a perpendicular dropped through anterior-inferior iliac spine at right angles to *L* *H* is distance between *L* and highest point on femoral neck, and *D* is distance between triradiate cartilage and intersection of *H* and *L*. (Courtesy of Coleman S S J A M A *162* 548 554 Oct. 6 1956)

birth the dysplastic hips that will progress to subsequent dislocation by examining 3 500 newborn infants specifically for skeletal deformities and by securing pelvic x rays from 150 unselected newborn infants for a study of normal dimensions averages and ranges It was found that in the newborn infant the usual physical criteria (such as unilateral shortening of the extremity) for the diagnosis of congenital hip dysplasia are inadequate and unreliable and discrepancies between clinical and x ray findings (such as a high acetabular index) were quite frequent (Fig 12) Congenital hip dysplasia was diagnosed in 32 of the 3 500 infants It is impossible as yet to tell which joints will be-

come stable spontaneously which will persist as subluxations and which will progress to frank dislocations Since the treatment is simple it should be applied in all cases that suggest a hip dysplasia.

Anteversion as Cause of Redislocation or Subluxation Following Reduction of Congenitally Dislocated Hips was studied by William M Steele and William L Minear[6] in 23 patients with 27 congenital dislocations of the hip They found that recurrent dislocation or subluxation following reduction was over five times more frequent when anteversion was over 40 degrees Thus knowledge of degree of anteversion aids the surgeon in deciding which hips are more likely to redislocate or subluxate after reduction Stability of the reduced hip may be anticipated before reduction

Anteversion is a torsional relation between the femoral neck and the femoral shaft and is not altered by a supracondylar derotation osteotomy The lower leg and knee merely are derotated in relation to the upper femur Perhaps for this reason results of supracondylar derotation osteotomy have not been entirely satisfactory The external rotary forces at play at the proximal end of the femur remain uncorrected The authors suggest that if anteversion is over 40% a subtrochanteric derotation osteotomy be done after follow up x rays demonstrate continued good reduction A subtrochanteric osteotomy allows derotation to a more posterior position of most of the insertion of the gluteus maximus What remains of the insertion above the osteotomy site may be sectioned One of the strongest of the redislocating external rotary forces thus is eliminated

In hips with open reduction identical pathomechanical forces are operative and the gluteus maximus insertion may be sectioned followed by derotation of the lower leg by supracondylar osteotomy if desired

Shelf Operation in Treatment of Congenital Dysplasia and Subluxation of Hip Joint in Adults With Special Reference to Prevention of Secondary Osteoarthritis Knut Bjørø[7] (Rikshosp Oslo) reports on 65 patients who had

(6) Quart. Bull. Northwest. Univ. M. School 30 43-44 1956

(7) Acta orthop. scandinav. 25 190-206 1956.

this operation Results were excellent or good in 85.2% of the dysplasias and in 60% of the subluxations

TECHNIC —No extension is used before the operation. The patient is placed supine and the hip joint exposed from the anterolateral aspect through a relatively short Smith Petersen incision. The muscles are stripped from the ileum. To place the shelf at the proper level it is usually necessary to loosen the attachment of the joint capsule above the acetabular margin from above downward until the operator can palpate the acetabular rim with his finger It is essential not to place the shelf too high for then the end result will be doubtful or bad. If the femoral head is anteverted the roof must be placed anteriorly

A groove about 3 cm long 0 5 cm wide and 2 cm deep is chiseled



Fig 13 (left) —Dysplasia on right side in man, aged 26.
Fig 14 (right) —Good [illegible] with well formed structure five years later
(Courtesy of Bjorn, K. Acta orthop. scandinav 25 190-206 1956.)

into the bone at the level of the acetabular rim. A graft (about 4 × 3 cm and 0.5 cm. thick) is taken from the ileum where it has the greatest concavity which will be a suitable roof for the femoral head. It is trimmed with bone cutters to fit the groove as accurately as possible and driven into the groove with the periost-covered surface toward the capsule (Figs 13 and 14) The muscles and skin are sutured without drainage.

The shelf operation is indicated in adults for (1) dysplasia either asymptomatic with increased neck shaft angle or with symptoms and only slight osteoarthritic signs and (2) subluxation with no or minimal osteoarthritic signs It is contraindicated in dysplasia and subluxation with secondary osteoarthritis in its destructive phase (Figs 15 and 16)



Fig. 15 (top) —Subluxated right hip joint with secondary osteoarthritis, grade III.
Fig. 16 (bottom) —Osteoarthritis developing further because graft was placed too high.
(Courtesy f Bjoro, K. Acta orthop. scandinav 25 190-206 1956)

► [This article provides evidence to support the principle of treatment of congenital dysplasia or subluxation of the hip joint in adults by means of a correctly placed, strongly built shelf. Most of the failures which I have seen occurred because the shelf was not correctly placed. The results reported by Bjøro are excellent.—Ed.]

Late Results of Treatment of Congenital Dislocation of Hip on Basis of 1 086 Hips Treated in Children Before Age 5 In evaluating late results of orthopedic treatment of 1 086

hips in 682 patients E Allenbach E Wiest and M C Wiest[1] (Strasbourg France) used the following rating method (1) functional which takes account of pain fatigue and capacity for activity (2) physical which is based on the mobility of the hip, limp muscular strength and shortening of the limb and (3) radiologic which is the most objective and easiest to measure and shows the changes in the form and size of the head anteversion angle of the roof and Wiberg s CE angle In a normal hip the values attached to the various factors in each rating equal 100 or 300 for the three

All patients in this series were treated by the same surgeons in the same clinic during the last 35 years All were followed re-examined and restudied radiologically A few answered a detailed questionnaire and sent their latest radiographs but no patient without a follow up of at least three years after the reduction was included

Analysis of the results according to the type of hip trouble showed that insofar as the treatment is concerned dislocations need not be distinguished from subluxations The dislocations present as developmental forms of luxations and the validity of this viewpoint is shown by the frequency with which intermediate forms are found The reducibility of a dislocation should be judged by the operator and not by arthrography In 80% of the patients arthrography after reduction showed the femoral head to be at least 1 cm away *from the base of the acetabulum As the months* passed under the plaster the head moved slowly and progressively toward the base provided it was immobilized and held in place for a sufficiently long period

The percentages of good and excellent results in dislocations and in subluxations reduced according to the same technic in children aged 12 24 months seen 3-35 years after reduction were similar i e 86 4% as compared with 89 5% In children aged 24 months 5 years the comparable figures were 59 4% for dislocations and 77.8% for subluxations Figure 17 shows the result obtained in a child treated orthopedically at age 3 after an earlier unsuccessful attempt at reduction During the last eight years the results obtained in dislocations in children in this age group have improved

(1) Rev chir orthop 42 169 184 Apr June 1956

in 77% of those with a follow up of three to five years no doubt because detorsion osteotomy and osteoplastic reinforcement are now done at the end of the orthopedic treatment.

Study of these cases shows that anteversion of the femoral



Fig. 17 —Bilateral dislocation treated and re-treated orthopedically at age 3 Result 14 years after reduction. Rating 300-300. (Courtesy of Allenbach, E., *et al.* Rev chir orthop. 42 169-184 Apr June, 1956)

head exceeding 40 degrees and failure to reconstitute the acetabular edge at the end of orthopedic treatment, resulting in a rating of less than 290 is followed immediately by worsening when the child resumes walking Severe post-reduction osteochondritis is the chief cause of the failures it is associated with the antiphysiologic position required to

maintain the reduction but it can be reduced by a careful choice of position and generous use of procaine infiltrations Open reduction is indicated only when orthopedic reduction is impossible this is true of not more than 15% of all patients now being treated

► [Dysplasia or dystrophy is the result, not the cause, of dislocation or subluxation of the hip. When the head of the femur is placed in contact with the dystrophic acetabulum and kept there, the acetabulum deepens. If the splinting of the hip permits hip motion while maintaining reduction as in the Putti Compere-Schnute or Ponsetti splint, the head of the femur and the acetabulum will shape and mold each other Splinting of this kind should be continued for 10-12 hours of each night until the hip is roentgenologically and functionally normal —Ed.]

Congenital Absence of Pectoral Muscle is discussed by Isadore Katz Robert M Fischer and Stephen D Berardinelli[8] (V.A Hosp Brooklyn) The pectoralis major is a large fan shaped muscle lying over the front of the chest immediately beneath the skin (Figs 18 and 19) Its congenital absence is one of a variety of conditions which produce unilateral increase in translucency in the chest x ray On casual inspection increased radiolucency of one lung field may lead the observer to suspect an intrathoracic condition such as unilateral pulmonary emphysema Closer examination shows that the lower border of the opacified area

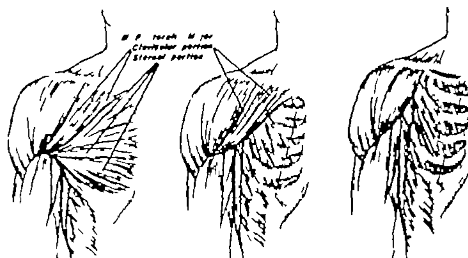


Fig 18 —Pectoralis major muscle. Left complete muscle in its normal relationships; center sternocostal portion of muscle is absent and clavicular portion remains right, muscle is entirely absent. (Courtesy of Katz, I et al. Am. J Roentgenol. 76 599-604 September 1956.)

(8) Am. J Roentgenol 76 599-604 September 1956.

runs across the lateral margin of the chest wall to th
and forms a somewhat elevated anterior axillary f

The most common affections of the chest wall
unilateral radiolucency are congenital absence of th
or the pectoralis major muscle postsurgical abs
these structures and atrophy of the pectoralis majo
disuse or following poliomyelitis

Intrathoracic conditions causing unilateral trans
clude agenesis of one or more lobes of the lung a



FIG. 19—Total absence of right pectoralis major (Courtesy of Katz
Am. J Roentgenol. 76:599-604 September 1956.)

hypoplasia or thrombosis of a pulmonary artery u
pulmonary emphysema and such conditions as p
thorax and cystic disease of the lung

Idiopathic Coxa Vara in Childhood In a serie
cases of idiopathic coxa vara in childhood Nathaniel
Harold G Jacobson and Maxwell H Poppel[9] fou
be congenital in origin and 16 developmental In co
idiopathic coxa vara the onset is earlier and there a
ciated anomalies the developmental form usually
after age 4 and is without other anomalies

In each group the chief x ray features in additio
coxa vara, are a vertical epiphysial plate and elev
the great trochanter The characteristic irregular
fragmentation of the proximal metaphysis are oft

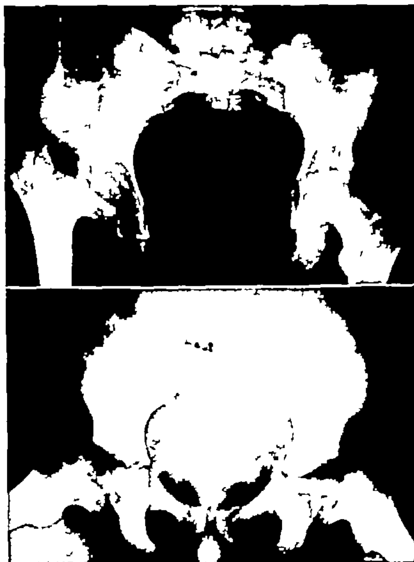


Fig. 20 (top) —Congenital coxa vara with acetabular dysplasia and some subluxation. There are one or two loose bodies in upper portion of metaphyseal area. Considerable deformity of femoral head is present. Note elevated, beaked greater trochanter.

Fig. 21 (bottom) —Bilateral developmental coxa vara with juxta-metaphyseal epiphyseal irregularity and bony spur in inferior metaphyseal area on left. There is considerable fragmentation with apparent necrotic bodies in femoral capital epiphysis. (Courtesy of Fisher, N. et al.: Radiology 67:10-16, July 1956.)

metaphysis and a short hypoplastic femoral neck (Figs 20 and 21)

The pathology and pathogenesis of idiopathic coxa vara are not clearly known. A tenable hypothesis suggests deficient osteogenesis in the femoral neck region with development of "pseudarthrosis."

The optimal treatment at present appears to be subtro-

chanteric osteotomy at an early age to promote solidification of the femoral neck with an improved alinement in weight bearing

Tibioperoneal Tenoplasty for Congenital Clubfoot with Peroneal Insufficiency is described by Juan Farill[1] (Mexico City) The tibialis anterior is transplanted through a subcutaneous tunnel from above the ligamentum transversum to the outer aspect of the dorsum of the foot In its new location it is sutured to the distal portion of the peroneus longus which has previously been severed above the outer malleolus (Fig 22) The pronatory action of the intact pero-

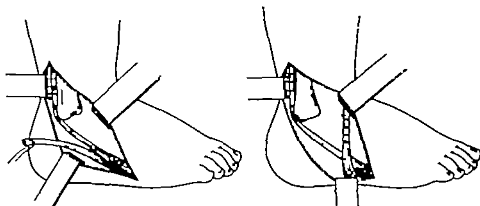


Fig. 22 (left) —Peroneus longus is severed and its proximal end sutured to the brevis behind the outer malleolus. An anchoring suture is inserted and distal end of peroneus longus is freed.
Fig. 23 (right) —Tibialis anterior is sutured to distal end of peroneus longus. (Courtesy of Farill, J J Bone & Joint Surg. 38-A.329-336, April, 1956.)

neus brevis is strengthened by the attachment to it of the proximal portion of the severed peroneus longus (Fig 23) The purpose of this operation is to correct the muscle im balance and thereby to maintain the corrected position of the congenital clubfoot and to prevent recurrences

This operation is indicated for (1) patients in whom hypercorrection has been attained passively for a sufficiently long time but in whom the action of the peronei has not been sufficiently improved despite several months of orthopedic and physiotherapeutic treatment (2) patients aged 4-5 who have had several recurrences of the deformity and (3) patients in whom overcorrection has not been obtained by conservative methods and in whom secondary bony de

(1) J Bone & Joint Surg. 38-A:329-336, April, 1956.

formities have not yet developed In the last patients the tenoplasty should be preceded at the same operative session by release of the medial and posterior soft tissues

Of 16 feet operated on by Farill the results were excellent in 8 good in 5 fair in 2 and poor in 1 In no instance did hypercorrection occur as a result of overaction of the transplanted muscle, and there were no adhesions around the tendons no failures of sutures and no instances of post operative pain in the foot

---

THE EPIPHYSES

Hereditary Metaphysial Dysostosis is reported by Robert Lenk[2] (Tel Aviv) in a girl aged 2 with disproportionate dwarfism showing signs of endochondral growth disturb-



Fig. 24—Pelvis of father f child; note bilateral coxa vara and healed slipped epiphyses. (Courtesy of Lenk, R. Am. J Roentgenol. 76:569-575 September 1956.)

ance The father uncle, grandfather granduncle and great grandfather showed similar dwarfism All characteristic signs of active or healed rickets were absent. X rays revealed inhibition of growth of all long bones and insufficient and irregular ossification of the metaphyses bilateral coxa vara (Figs 24 and 25) normal development of epiphy

(2) Am. J Roentgenol 76 569-575 September 1956.

ses (Fig 26) normal development of centers of ossification of carpal and tarsal bones absence of signs of periosteal growth disturbance and normal skeleton of trunk and skull

The condition belongs to the group of pure endochondral growth disturbances The findings differ essentially from the most important and frequent representative of this group chondrodystrophy (achondroplasia) as follows (1) absence of developmental disturbances in the epiphyses and in the centers of ossification of the small bones and



Fig. 25 (left) —Pelvis and hip joints of child note normal femoral heads. Femoral necks are short, irregularly limited by preparatory zone of calcification. Epiphysial cartilage is broad with small deposits of bone.

Fig. 26 (right) —Right hand of child carpal bones and all epiphyses developed according to age. Note irregular preparatory zones of calcification with small indentations.

(Courtesy of Leak, R. Am. J Roentgenol. 76 569 573 September 1956.)

(2) absence of typical changes in the skull and of certain secondary appearances such as saddle nose and flat pelvis.

Dysplasia Epiphysialis Multiplex is reported in four patients without dwarfism stubby digits or mental retardation by Wm R. Christensen Ru Kan Lin and John Berghout[3] (Salt Lake City) This unusual congenital disorder of skeletal development has been reported in 34 cases

Case 1—Girl 11 rather knock-kneed for a long period, walked with a ducklike gait, with wide base. X rays revealed irregular epiphysial outline and ossification involving both hips ankles, knees and wrists (Fig 27) Skeletal maturation of the wrists was delayed.

Case 2—Girl 12 (sister of patient in Case 1) with waddling gait with wide base since age 16 months and pain on walking since age 7

(3) Am. J Roentgenol. 74 1059 1067 December 1955

had limitation of hip motion and difficulty in climbing stairs. She had ducklike gait with genu valgum X rays revealed irregular epiphysial outline particularly of hips shoulders and knees.

CASE 3—Woman 38 (mother of patients in Cases 1 and 2) had waddling gait and limitation of hip elbow and shoulder joints. She had had difficulty in walking since age 16 months Later hip pain had developed and she had been hospitalized at age 18, with diagnosis of flat hip joint and flat lower lumbar vertebrae. X rays revealed that femoral and humeral heads and distal tibial articulation were deformed

CASE 4—Boy 5 had waddling gait. He had limped since age 21

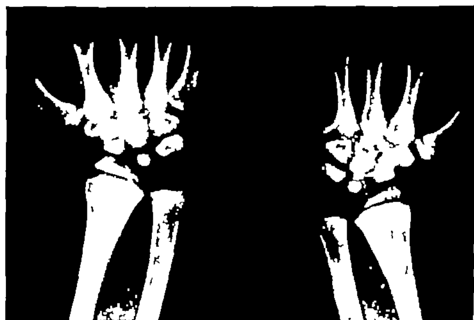


FIG 27—Anteroposterior view of wrists (Courtesy of Christensen W R. et al: Am. J Roentgenol 74 1059 1067 December 1955)

months, following a fall down the stairs, and had been admitted to the clinic nine months after the fall X rays revealed epiphysial irregularity particularly of hips and shoulders

This disease process largely involves the developing epiphyses which show ossification from multiple discreet centers and gross irregularity of outline. The basic defect is an abnormality of epiphysial ossification The metaphyses are rarely involved

After fusion of the epiphyses the disease is subject to spontaneous arrest with achievement of normal trabeculation However the sequelae of irregular articulating surface and coadaptive changes are degenerative osteoarthritic

changes Their severity depends on degree of deformity No definite etiology has been established. Hereditary influences are apparently important. No therapy of proved value is available

Epiphysial Stimulation in Lower Extremities to correct disparity in length was done by Warren G Kramer[4] (Los Angeles) in 12 children aged 1½-8 years 8 with congenital shortening of a lower extremity and 4 with residual effect of postpoliomyelitis During surgery the distal metaphysis of the femur or the proximal metaphysis of the tibia was exposed Though ivory pegs or brass screws were placed across the bone in some patients and multiple drill holes were used in others no difference was noted in the amount of stimulation brought about Stimulation persisted 6-10 months after operation

Kramer believes that stimulation is due to periosteal elevation and subperiosteal hematoma and that any persistence of stimulation is due to subperiosteal reaction only Perhaps prolonged stimulation can best be accomplished by elevating the diaphysial periosteum and placing absorbable foreign material such as chromic catgut under the periosteum Foreign material that is buried in the bone itself does not cause stimulation of the epiphysial plate

Complications that may occur are varus or valgus deformities delay in growth complete fusion or infection To prevent varus or valgus deformity both medial and lateral sides may be stimulated simultaneously The screws should not be placed closer than ¼ in. to the epiphysial plate to avoid trauma which may delay rather than stimulate growth Late infection may be obviated by use of absorbable materials

► [I am pleased to note that the results of these experiments seem to confirm the opinion which I expressed following a similar study in 1937 The hyperemia of repair causes increased rate of growth, and the growth stimulus continues as long as repair of the injury to the bone is taking place. The statement by Kramer that "foreign material that is buried in the bone itself does not cause stimulation of the epiphysial plate" is significant.—Ed.]

Critical Evaluation of Method of Epiphysial Stimulation. Earnest B Carpenter and James B Dalton[5] (Richmond Va) attempted epiphysial stimulation in 30 children by in-

(4) California Med. 83 424-426, December 1955
(5) J Bone & Joint Surg. 38-A 1089-1095 October 1956.

tramedullary ivory implants in the distal end of the femur and proximal end of the tibia Each patient was followed at least 30 months Some increase in growth was obtained in 26 The maximal gain was ⅛ ¼ in in 70% of the patients Many patients were under the age at which a limb shortening or epiphysial arrest procedure could be done Though the gain was negligible the procedure prevented inequality in length from becoming greater and in several instances reduced inequality to a small amount

For this reason the authors believe that the procedure has some merit in a few isolated instances such as in a child under age 6 with a discrepancy of 1½ in or more and with a flail extremity secondary to poliomyelitis The method probably will prevent the discrepancy from becoming greater before such time as a growth arrest or limb-shortening procedure might be indicated They also believe that in a child with a discrepancy of 1 in or more who has had surgical relaxation of a tight iliotibial band a stimulating procedure can be carried out through the same operative incision with little additional trauma or operative time

Viability of Transplanted Epiphysial Cartilage William F MacDonald Robert J Barnett and Ernest A Brav[6] (Walter Reed Army Hosp) conducted the following experiments in dogs (1) removal and *immediate reimplantation* of an epiphysial plate (2) immediate autogenous transplantation of another epiphysial plate (3) immediate fresh homogenous transplantation and (4) transplantation of refrigerated and preserved epiphysial plates When reimplantation of an epiphysis was immediately performed at its original site the epiphysis continued to grow although growth was definitely retarded Autogenous transplantation of epiphysial plates resulted in no growth and early closure of epiphysial lines Fresh homogenous transplants and preserved frozen transplants either autogenous or homogenous produced no x ray evidence of *cellular* viability or continued cartilaginous bone growth

Effect of Compression on Growth of Epiphysial Bone in calves was studied by L J Strobino Paul C Colonna, R. S

(6) U S Armed Forces M J 7 59-62 January 1956.

Brodey and Thomas Leinbach[7] (Univ of Pennsylvania) The study shows that epiphysial bone follows an "all or none" law of growth with respect to compressive force exerted against it to a point far beyond any physiologic value expected and quite probably to the limit of its force value. The force exerted by the upper tibial epiphysis of the calf is a little less than the total weight of the animal shown by the reading of 340 lb necessary to produce epiphysial arrest. This amount is equal to about 45 lb /sq in cross section The epiphysial plate was arrested for about six months in the calf which is equal to three or four years in man The plate remained viable and thereafter resumed growth sufficient to produce equalization of bone length thereby regaining 1⅛ in

Fracture Separation of Proximal Humeral Epiphysis Study of Cases Seen at Presbyterian Hospital from 1929 to 1953 is presented by Frederick M Smith[8] (Columbia Univ) Among the 43 patients ratio of boys to girls was 3 1 Average age of the boys was 13 and of the girls, 11 Etiology included falls sports and traffic accidents

Ambulatory measures were employed in 24, 10 were hospitalized with use of conservative measures and 9 were hospitalized with use of conservative measures and open reduction Conservative treatment consisted of attempted reduction under anesthesia in 22 traction and suspension by means of Kirschner wire with the arm held over the body in 14 and plaster splints or casts in 16 or by sling and swathe only Exercises were started at 12+ days on the average in nonoperative patients and at 19 days in operative patients Open reduction was performed in nine patients mainly because attempted closed reduction was unsatisfactory in eight of these.

Results in general were excellent in regard to function and use Anatomically, two main deformities were noted (1) slight angulation or prominence of the upper humeral shaft and (2) measurable shortening The latter was definite in 10 The patient with the greatest shortening was the youngest operated on Of the severely displaced fractures not operated on two were in children aged 5½ and 8, with

---

(7) Surg., Gynec. & Obst. 103 95 93 July 1956.
(8) Am. J Surg 91 627-635 April, 1956.

marked comminution In the latter child (Figs 28 and 29) treatment consisted of manipulation traction and suspension with a sling used later A severely displaced fracture was also noted in a boy aged 12 with poison ivy rash that prevented operation

The results indicate that fracture separation of the proximal humeral epiphysis appears on its face far more serious than it actually is Bony healing occurs rapidly and essentially full recovery of shoulder and arm function results.



Fig 28 (left) —Anteroposterior view in boy aged 8 of original fracture with marked comminution of upper shaft and diaphysial fragment attached to epiphysis. No better position could be obtained from x-ray standpoint.
Fig. 29 (right) —Same humerus 22 months after original injury Note marked correction of original deformity
(Courtesy of Smith, F M Am. J Surg. 91:627-635 April, 1956.)

By subsequent growth the greater part of the original angular deformity corrects itself

► [All surgeons who are quick to do an open operation in an attempt to obtain perfect reapposition of fracture fragments or of epiphysial displacements in young children should read and ponder over this article. The ability of the bones of a young child to remodel and regain normal or almost normal alinement and to continue to grow, so that even after marked displacement of the epiphysis the end result, as determined by physical examination and x ray will after two or three years be essentially completely normal, is indeed remarkable.—Ed.]

Experimental Studies and Clinical Evaluation of Linear Growth Wayne S Montgomery and Alvin J Ingram[9] (Campbell Clinic Memphis Tenn) attempted to stimulate longitudinal growth of the femur and tibia in rabbits by ivory implantation and periosteal stripping with and without postoperative immobilization Stimulation of growth was possible but not consistent enough or of great enough

(9) South. M J 49:793-798, August, 1956.

magnitude, when present to be of significance. Microscopically and numerically it appeared that postoperatively weight bearing favored utilization of exogenous implants and stimulation appeared more likely Growth stimulation was studied also in 32 children Brass screws or ivory pegs were used as implants Growth lines when present clinical measurements and calibrated x ray studies were used to evaluate results The implants did not stimulate growth

Subepiphysial Light Lines in Infants with Special Reference to Osteomyelitis In several diseases of early infancy that are difficult to differentiate subepiphysial lines of variable width and density are seen in x-rays These lines appear as a zone of lesser density than that of the epiphysial line of the neighboring parallel metaphysis Trabecular structure is fully preserved so that epiphysial lines are sharply delineated and toward the diaphysis there is sharp separation of the clear bands These are symmetrically distributed in the skeleton and show predilection for the distal femur and proximal tibial metaphysis They are seldom found in upper extremities because of lesser growth intensity there Present consensus is that the clear lines both morphologically and pathogenically are antagonists of so-called dark bands and usually precede the latter These were formerly usually designated as growth arrest lines" although they were also observed with accelerated growth

E. Willich[1] (Bremen) observed clear lines in the subepiphysial region in the roentgenologically negative phase" during the first 14 days of acute hematogenous osteomyelitis in 11 of 16 infants In a few lines first appeared with onset of typical x ray osteomyelitic changes particularly with periosteal shadows and in one double contour that suggested congenital syphilis but this was excluded serologically in the mother and child In most instances clear zones were found on appearance of clinical symptoms i e during the roentgenologically negative phase and proved to be reversible They either disappeared before typical osteomyelitis bone changes were visible or afterward or became recognizable as dense lines (Fig 30) They were localized not only at sites later attacked by osteo-

(1) Fortschr Geb. Röntgenstrahlen 84:587 597 May 1956.

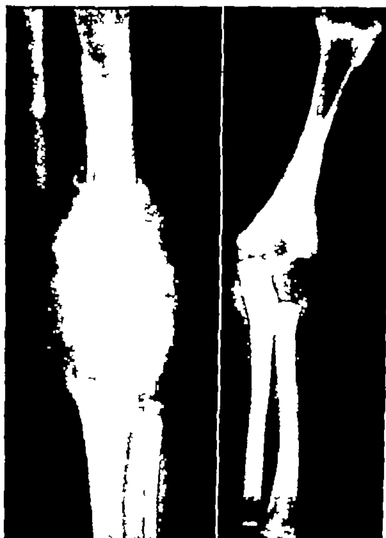


Fig 30 (left) —Left femur and knee joint two months after onset of osteomyelitis, showing transformation of clear l to dense lines

Fig. 31 (right) —Left upper extremity two months after onset of osteomyelitis. Note clear lines being transformed into dense lines, osteomyelitis undergoing healing and periosteal thickening

(Courtesy of Willich, E. Fortschr Geb Röntgenstrahlen 84 587 597 May 1956.)

myelitis (Fig 31) but in all epiphyses even those distant from the disease focus

Clinically syphilitic bone disease and osteomyelitis are similar sites of predilection may be the same or similar and characteristic pain sparing of an extremity (pseudoparalysis) inflammation or swelling of affected joint and spindle form swelling are common factors Enlargement of spleen may exist in either but is more frequent with

syphilis Roentgenologically both diseases in early stages show clear bands in the epiphyses of long bones and periosteal involvement is similar Pathologically the lesions are also very similar

In one infant with osteomyelitis who came to autopsy nonosteomyelitic epiphyses with roentgenologically clear lines showed no definite histologic changes This is in accord with experiences of others and permits the conclusion that the x ray change is due to a disturbance in mineralization since slight changes in calcium content of bones are macroscopically and microscopically difficult to determine X ray examination is undoubtedly superior to microscopic in revealing slight changes in calcium content or spongiosa structure.

Not only the spirochete but other bacterial infectious-toxic or chemical factors and all deviations in mineral and water content of uncertain etiology lead to these epiphysial lines which represent trophic changes of enchondral ossification Their relation is documented by the fact that they affect the same age group are reversible, have the same sites of predilection and are roentgenologically identical.

POLIOMYELITIS

Astragalectomy as Stabilizing Operation for Foot Paralysis Following Poliomyelitis Results of Follow up Investigation of 153 Cases. H C.son Holmdahl[2] (Göteborg) re-examined 153 of 358 patients with astragalectomies The object of the operation was to correct and stabilize various types and degrees of foot deformities that had resulted from poliomyelitis Most patients fell ill before age 7 and most were operated on between ages 9 and 15 Anatomic results were good in 18.3% fairly good in 47% and poor in 34.7% functional results were good in 32% fairly good in 56.9% and poor in 11.7% Patients with an equinus component showed better results than those with some form of calcaneal deformity

In about half the patients operation caused slight short-

(2) Acta orthop. scandinav 23:207 227 1936.

ening of the leg in the other half there was no shortening or operation contributed toward a postoperative lengthening of the leg The highest percentage of good results was obtained in the group aged 11 12 X rays showed that 34% formed a bony ankylosis In patients with retained mobility ratio of good results to poor was 2 5 1 and in patients with fibrous ankylosis good results were almost twice as numerous as poor

If complete retroposition of the foot is not obtained at operation risk of a poor end result is great Of 60 patients with complete retroposition 48 showed good functional results Loose bodies' (as a rule residual parts of the extirpated talus) occurred in 10 without giving rise to increased pain in weight bearing and walking

Need for permanent splints depends more on residual paralysis in the hip and knee joint than on any defective result of the operation More than half the patients do not require orthopedic aid after operation

Ineffectiveness of Splinting in Treatment of Abductor Paralysis at Shoulder W J W Sharrard and T Knowelden[3] studied 230 patients with 359 upper limbs affected by some degree of abductor paralysis at the shoulder six weeks after onset of acute poliomyelitis Records were made of the power of the deltoid and other muscles of the shoulder and upper arm of the passive mobility of the shoulder joint and of the function of the upper limb at this time and not less than 18 months later The final state of patients in whom an abduction splint had been used was compared with that of patients in whom no splint had been used after six weeks from onset of poliomyelitis

While recovery of deltoid muscles paralyzed at initial assessment was diminished by splinting in abduction recovery of paretic muscles appeared to be unaffected by splinting Incidence of laxity of the shoulder joint was related to severity of paralysis of the scapulohumeral muscles this laxity was increased by splinting in abduction Adduction contracture if not already present, did not develop after six weeks in unsplinted shoulders that were passively mobilized daily In the acute stage of poliomyelitis immobiliza

(3) Lancet 1:9-13 Jan 7 1956.

tion of the upper limb by the side produced more or less severe adduction contracture

Structural scoliosis was never found when paralysis affected the upper limb musculature alone even when paralysis was severe and unilateral Splinting in abduction to prevent scoliosis is therefore unnecessary Occasionally a partially abducted position of the shoulder may allow better function of the rest of the upper limb If so a modified splint may be useful in bilateral abductor paralysis in young children

The study shows that except in the acute stage of poliomyelitis and in special circumstances in the convalescent stage splinting in abduction is unnecessary and sometimes harmful

Results of Quadricepsplasty in Poliomyelitis Analysis of Series of 56 Operations is presented by J Canadell-Carafi and L. Barraquer-Bordas[4] (Barcelona) Electromyographic studies have established the value of myoplastic procedures Myoplasty of the quadriceps is indicated when paralysis of this muscle is below the third degree of muscular strength as given by the National Infantile Paralysis Foundation provided that the muscle is otherwise in acceptable condition

Feasibility of this procedure is proportional to the state of the other muscles in the affected limb In general it is related inversely to the power of the flexors of the knee and hip and directly to the power of the extensors (gluteus and triceps) According to the authors indications the ideal quadriceps plastic procedure is one that can be carried out with the semitendinosus biceps and tensor of the fascia lata when they are in good condition

Analysis of the results shows that they are directly proportional to the strength of the transplanted flexors and muscular power of the gluteus maximus and triceps and to the residual force of the quadriceps itself This can be explained by distinguishing between the efficacy of the quadriceps myoplasty in itself (for the isolated extension of the knee) and its usefulness in relation to walking It is this last that is directly proportional to the power of the other extensor muscles of the limb though it still retains

(4) Acta orthop. belg 21 241 251 1955.

a certain indirect relation to the power of the untransplanted flexors of the hip

When the patients were classified according to the preoperative neuromuscular status of the quadriceps, it became clear that the greater its residual force the better the average result of the operation thus from an average of 2.33 for the myoplasty (derived by adding the values of the flexors used in each case and dividing by 34 i e., the number of cases) for a quadriceps with a rating of 0 the rate increases to an average of 4 when the quadriceps has a rating of 3 As failure of the operation occurred in only 2 of the 56 patients myoplasty of the quadriceps supplemented by careful re education can be expected to succeed in almost all patients if operative indications are accurately evaluated in each case For this the proportion between the power of the quadriceps and that of its flexor antagonists must be ascertained the state of the motor muscles of the hip and foot and the articular stability dependent thereon must be learned and less directly the condition of the other limb the pelvis and other related factors must be taken into account

The principal functional benefits of the operation are (1) patients who had to hold the hands on the thighs to walk no longer need do so (2) patients who were subject to frequent falls do not fall or fall only rarely and (3) patients hampered by constant pronounced fatigue are freed from this inconvenience

► [If the cases are carefully selected and the technic of transfer of the hamstring tendons to the patella is carefully carried out, results will be good. No muscle which is less than 50% normal should be transplanted. The muscles which are transplanted should be isolated proximally in the thigh to permit a direct pull between the origin of the muscles and insertion in the patella. The tendon should be sutured to the bone, not to the quadriceps tendon. When possible, both a medial and lateral hamstring muscle, or a medial hamstring and the tensor fascia femoris, should be transferred. Transfer of only a lateral or a medial tendon may result in subluxation or dislocation of the patella later —Ed.]

Coccidioidomycosis of Bone. The condition occurs only in the disseminated disease. There seems to be predilection for cancellus bone especially bony prominences Cartilage offers no barrier for spread of infection Sequestration is rare Usually only moderate reaction of the surrounding



Fig. 12.—Destruction in upper tibia. (Courtesy of Levy L. J et al. Texas J Med. 52:27 31 January 1956.)

bone to the infection is noted Joints are usually secondarily infected by extension from bone The clinical course includes pain swelling redness progressing to fluctuation, ulceration and draining sinuses Excision of bone lesions and synovectomy of involved joints appear to be worth while in some instances Louis J Levy Cuvier P Lipscomb and Henry C McDonald Jr[6] (Fort Worth) report on a patient

Man, 45 with recurrent episodes of pain and swelling in the left knee for 11 or 12 years walked with a moderate limp of the left knee. He showed generalized swelling of the left knee joint, which had a

(6) Texas J Med 52:27 31 January 1956

full range of motion, and tender firm swelling of the posteromedial and lateral aspects of the upper tibia just anterior to the head of the fibula. The ligaments were apparently normal X rays of the knee revealed destruction of the posteromedial aspect of the tibia just beneath the joint surface measuring 3-4 cm in diameter A small defect of the same type was noted in the lateral portion of the upper tibia (Fig 32) Surrounding bony reaction was mild to moderate.

On excision of the lesion a chronic inflammation was encountered, and a grayish pink, semigelatinous material was removed from the



Fig 33—Specimen removed from bone at surgery, showing typical granulomatous lesion of coccidioidomycosis, containing double-refractile spherule. (Courtesy of Levy L. J., *et al* Texas J Med. 52:27-31 January 1956.)

cystic area. The cortex was perforated by the process in one area, with extension of this material into the overlying soft tissues. When the joint was opened, excessive joint fluid was found. The synovia was thick, boggy and covered with shaggy grayish pink villi. Histopathologically the synovia showed granulomatous tissue reaction, with tubercle formation lymphocytic and plasma cell infiltration and Langhans giant cells. A few double-refractile spherules were found (Fig 33) A Coccidiodes immitis culture also was grown on Sabouraud s medium from the tissue removed. Surgery completely relieved knee pain.

Acute Hematogenous Osteomyelitis is reported in 99 infants and children by Morris Green William L. Nyhan

and Mildred D Fousek[6] (Yale Univ) Differentiation from rheumatic fever generalized septicemia suppurative arthritis poliomyelitis bone tumor and cellulitis may be difficult in the acute stage. Localized tenderness is the most significant early clinical sign though it was not a common finding on hospitalization The femur tibia and humerus were the most frequent sites of bony involvement. Involvement of the bony pelvis was frequent and was discovered late in some patients because of failure to consider the diagnosis

A specific bacteriologic diagnosis was made in 87% of the patients. Staphylococcus was the etiologic agent in 63% and beta hemolytic streptococcus in 18 patients Staphylococcus was the most frequent offender in all age groups Among infants under age 2 osteomyelitis was streptococcic in 27% Average interval from onset of symptoms to development of positive x ray signs was 10 days with a range of 3-17 days

The authors advise that patients suspected of having osteomyelitis be treated vigorously with antibiotics after onset of symptoms If at the end of three weeks x rays remain normal and clinical signs and symptoms have been absent for at least one week, it is probably safe to discontinue treatment Vigorous search for the infecting organism should be made Penicillin 1 000 000 units every two hours as the initial dose is the drug of choice in streptococcic osteomyelitis A combination of two antibacterial agents is used in staphylococcic osteomyelitis Though surgical intervention is rarely necessary today the patient must be observed for such indications as fluctuation

Possibilities of Utilization of Metal or Acrylic Implants for Pseudarthrosis or Luxation after Osteomyelitic Infection are considered by Marcel Fèvre[7] (Paris) with special reference to the interval that must elapse after an attack before they can be tolerated The results in 15 patients show that an acrylic prosthesis can be used without reactivation of the infection in plastic operations on patients who have had osteomyelitis of the hip

(6) Pediatrics 17 368-382, March, 1956
(7) Rev chir orthop 41 669-682, Oct Dec 1955

In determining the advisability of such a procedure, type of osteomyelitis duration interval since its cessation and age of the patient at onset must be taken into account. Arthroplasty should probably be postponed for at least a year after subsidence of an osteolytic infection in infancy In the youngest patient in this series the infection began at age 1 month and operation was performed when the child was 18 months old six months after the last attack. No recurrence of infection was noted in any of nine patients with infantile osteomyelitis who were operated on from six months to four years after the last inflammatory attack.

Children in whom osteomyelitis occurs between ages 2 and 4 should not be operated on until the suppuration has been completely stopped for at least 16 or 18 months One child in this category was operated on successfully without recurrence of infection When osteomyelitis occurs in older children especially in adolescents several years must apparently be allowed to elapse before an arthroplasty with an acrylic head can safely be performed Three patients operated on from three to four years after suppuration had ceased had no recurrence of infection but in the fourth the operation was a failure because the infection became active again

These same conditions probably apply to the use of metal prostheses which were used in two children A diaphysial nail and screws of metal were used successfully in one but in the other only the metal stem of the prosthesis penetrated into the diaphysis

This report deals only with the question of tolerance not with the degree of mobility secured which was variable or with choice of method

Postoperative Infection of Intervertebral Disk Space. Lee T Ford and J Albert Key[8] (Washington Univ) point out that it is possible after operation for an intervertebral disk lesion for a low grade infection to develop in and remain localized to the intervertebral disk space Such a possibility must be kept in mind when undue back and sciatic pain develop in a patient with or without a febrile course after a disk operation Presence of a cleanly healed inci

(8) South. M J 48 1295 1303 December 1955

sional wound does not rule out infection of the disk space. Infection may be dormant for a while or be masked sufficiently to be undetected for weeks or months Antibiotics are largely responsible for this masking and without them a fulminating operative wound infection might develop Once such an infection is evident or is strongly suspected a second operation is indicated for evacuation and drainage of the intervertebral disk space The second operation may be undertaken to relieve persistent pain and disability and infection may not be suspected

If evidence of infection is found in the disk the posterior portion of the annulus should be opened widely Particular care should be taken not to tear or incise the dura. The disk space should be curetted gently but thoroughly and the wound irrigated with a warm sulfonamide solution Penicillin powder should be placed in the disk space and a small petrolatum gauze or rubber tissue drain left in the infected area and led out through the wound The wound should be closed in layers and general antibiotic and supportive therapy continued In four patients observed by the authors the operation for drainage was not performed nor was the infection suspected until weeks or months after the primary procedure

Treatment of Bone and Joint Tuberculosis is reported by Alan DeForest Smith[9] (Clinic of New York Orthopaedic Dispensary and Hosp) In all patients diagnosis should be proved beyond doubt, by aspiration and guinea pig inoculation or by biopsy Treatment consisted of anti tuberculous drugs with or without arthrodesis Streptomycin alone cannot replace surgery though it makes surgical success more feasible The combination of streptomycin and dehydrostreptomycin with PAS and iproniazid or isoniazid together with spine fusion or arthrodesis showed better results than surgery with streptomycin alone. Iproniazid did not appear to be superior to isoniazid

Most striking were the effects of both streptomycin and the isonicotinic acid derivatives on abscesses and sinuses Though it still is necessary to deal with the focus from which the abscess arises with administration of these

(9) J Bone & Joint Surg 37 A 1214-122., December 1955

drugs the tendency for the abscesses to become smaller and for the sinuses to close is greater

There is evidence that synovial tuberculosis of the knee may be treated successfully without surgery and that this treatment may also apply to tuberculosis of the tendon sheaths of the wrist and hand Smith believes that by themselves these drugs are not adequate treatment that they should be used as an adjunct to surgery and that arthrodesis is still the safest and most effective treatment

Report of Four Proved Cases of Tuberculous Bone or Synovial Infection Treated with Streptomycin is presented by James Dougherty and Mary S Sherman[1] (Univ of Chicago)

CASE 1—Girl 4 had had limp and pain in the left hip for seven months. Examination showed limitation of left hip motion and atrophy of the thigh and calf x rays revealed bone destruction in the ilium above the acetabulum and in the capital femoral epiphysis and neck. Results of tuberculin test were positive. Arthrotomy and curettage revealed thick yellow pus positive for tubercle bacilli by culture and guinea pig inoculation.

She received 0.5 Gm. dihydrostreptomycin intramuscularly and 6 Gm. PAS orally/day and was kept in bed for eight months. She was then allowed to use crutches and was discharged. Full weight bearing was started a year after treatment began with complete range of painless motion. X rays revealed filling in of destructive areas She was well four years later

CASE 2.—Boy 4 had had pain in right shoulder for six months. Examination showed pain on abduction and extension and tenderness over head of the humerus Results of tuberculin test were positive, and x rays disclosed destruction in the proximal humerus. Arthrotomy showed pus and synovial biopsy revealed tuberculous granulation tissue. For 3½ months he received 1 Gm. dihydrostreptomycin, intramuscularly and 6 Gm. PAS orally/day Four years after discontinuation of treatment, the shoulder was painless, motion normal and x ray revealed healing of the lesion.

CASE 3—Girl 3 was hospitalized because of painless swelling of right knee for three months. Results of tuberculin test were positive, and x ray demonstrated destruction in the proximal tibia. Active tuberculosis was shown by biopsy curettage and guinea pig inoculation with fluid from the knee She received 0.5 Gm streptomycin and 6 Gm PAS/day A cast was replaced by a brace after six months and drugs were stopped. Full activity without support was allowed after nine months The knee was painless with normal motion 3½ years after all treatment was stopped, and x rays revealed repair of old defects.

(1) J Bone & Joint Surg 37 A 1223-1230, December 1955

CASE 4—Boy 4½ with intermittent swelling and stiffness of right knee for a year showed moderate restriction of motion on examination. Results of tuberculin test were positive. X rays were negative for bone change and cultures of aspirated fluid were sterile. Synovial biopsy revealed active tuberculosis.

He received 0.5 Gm. dihydrostreptomycin and 150 mg isoniazid/day for eight months, and bed rest was instituted for three months Two years after discontinuation of therapy the knee was normal clinically and by x ray

The authors conclude that good results may be obtained from early treatment of tuberculous arthritis by streptomycin In one patient streptomycin alone was curative for tuberculous synovitis Surgical curettage of concomitant osteomyelitis was effective with streptomycin in three.

TUMORS CYSTS AND FIBRODYSPLASIA

Aneurysmal Bone Cyst is a well defined lesion of unknown etiology and relatively benign course There is sufficient evidence to support the theory that it may not be a true neoplasm and that it is definitely not a traumatically induced hematoma. The lesion is often mistaken for giant cell tumor and less frequently for juvenile bone cyst or bone angioma According to Miguel Cruz and Bradley L Coley[2] (Memorial Center for Cancer New York) when the lesion is located in the long bones it generally affects the proximal or distal diaphysis and seldom involves the epiphysis except secondarily in neglected cases It presents a cystic cavity destroying the cortex, as evidenced by the fuzziness of the contour and lack of continuity This condition is associated with an expansile denser than water mass which protrudes eccentrically into the adjacent soft tissues The rim of this mass is lined by a shell of periosteal new bone a few millimeters thick This is the typical so-called blown-out pattern of which there may be several variants (Fig 34) In the flat bones the appearance of the lesion may be modified by the local anatomy (Fig 35)

Grossly when the surgeon removes the protective shell of bone he is confronted with a cystic cavity formed by

(2) Surg., Gynec. & Obst. 103 67 77 July 1956.



Fig. 34 (left).—Aneurysmal bone cyst of midportion of femur in adolescent. Note typical blown-out appearance.
Fig. 35 (right).—Destructive lytic lesion in ascending ramus of pubis. Typical blown-out appearance is lacking.
(Courtesy of Cruz, M., and Coley, B. L.: Surg., Gynec. & Obst. 103:67-77, July 1956.)

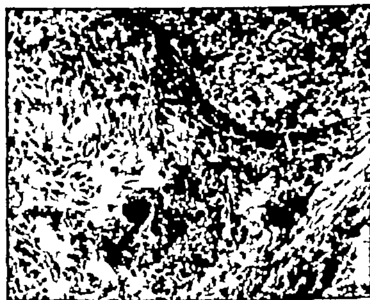


Fig. 36.—Endothelium-like cells lining vascular spaces vary from spindle shaped to cuboidal. Occasional giant cells abut on vascular spaces. Adjacent supporting connective tissue stroma shows hemorrhagic suffusion, multinucleated giant cells and osteoid formation. Hematoxylin-eosin. (Courtesy of Cruz, M., and Coley, B. L.: Surg., Gynec. & Obst. 103:67-77, July 1956.)

large spaces containing fluid and nonstagnant blood which does not spurt or pulsate but which wells up continuously until complete removal of the tissue is effected The red or brownish mesh of fibrous tissue encountered in the cavity is usually of meager amount Microscopically this fibrous tissue is seen to be formed of long fusiform cells with elongated nuclei In addition hemosiderin laden phagocytes and giant cells are observed at times lining the vascular spaces (Fig 36)

It is important to distinguish this lesion from the telangiectatic type of osteogenic sarcoma and thus prevent unnecessary amputation The treatment of choice is surgical eradication by curettage complemented by bone graft when necessary X ray therapy should be reserved for surgically inaccessible lesions Delay in treatment may result in severe damage to bones joints and soft parts and may eventually necessitate amputation The authors have not observed any cases of spontaneous regression

Benign Chondroblastoma has become firmly established as a distinct entity among the primary tumors of bone. The proliferating cells of this neoplasm produce foci of chondroid matrix and this attribute is the rationale for classifying it as a neoplasm of cartilaginous derivation Melvin G Kunkel David C Dahlin and H Herman Young[3] (Mayo Clinic) report their observations on 16 patients with benign chondroblastoma of bone including 10 males and 6 females aged 8-54 The long tubular bones were the site of 10 of the 16 tumors 4 involved the innominate bone. Nine of the 10 tumors in the long bones were entirely or partially in the epiphysis

In 15 patients the presenting complaint was local pain and in 1 it was swelling Duration of symptoms varied from 3 months to 16 years The complaints concerned the adjacent joint in most instances There was a palpable mass in the area of the tumor in 7 instances and limping and muscle wasting were common

The x ray appearance of the lesion tends to be round or ovoid It may be confined to a part of an epiphysis or it may extend through the epiphysial plate into the metaphysis and diaphysis if large (Figs 37 and 38) Lesions which extend

(3) J Bone & Joint Surg 38 A 817 76 July 1956.

into the metaphysis may grow so large that the overlying cortex is expanded and sometimes even destroyed

The histologic features put the benign chondroblastoma into the group of benign tumors of cartilaginous derivation, in which chondromas osteocartilaginous exostoses and chondromyxoid fibromas also belong The authors found a close relation between chondromyxoid fibroma and chondroblastoma

Chondroblastomas are benign and respond favorably to





Fig 37 (left) —Chondroblastoma in epiphysis of upper 3 cm of humerus. Tumor has spread across epiphyseal line and has typical fuzzy rarefied appearance Periosteal reaction is present and lesion involves articular cartilage.

Fig 38 (above) —Note somewhat variegated appearance of lesion, which has broken through articular cartilage

(Courtesy of Kunkel, M G., et al. J Bone & Joint Surg. 38-A 817-826, July 1956.)

conservative surgical management No malignant counterpart or malignant transformation of this tumor was encountered by the authors

Chondromyxoid Fibroma of Bone with Emphasis on Its Morphologic Relationship to Benign Chondroblastoma. David C Dahlin[4] (Mayo Clinic) studied five women and six men aged 6-54 with chondromyxoid fibroma. Local pain of about a year s duration was the presenting symptom in nine patients X ray examination strongly suggested a benign lesion in all patients The usual defect was an

(4) Cancer 9 195 203 Jan. Feb. 1956.

eccentric, sharply circumscribed zone of rarefaction which occasionally caused slight expansion of the bony contour (Fig 39) The cortical outline was partially absent over three tumors Trabeculae apparently traversed the defect in most cases Calcification within the tumor was not observed nor was sclerosis of the immediately adjacent bone a significant feature. The tumors were commonest in the tibia and varied from 1 5 to 5 cm in diameter Seven tumors had a gross cartilaginous appearance.

The name of the neoplasm chondromyxoid fibroma indi-



Fig. 39 —Chondromyxoid fibroma of upper part of tibia, showing scalloped but distinct border (Courtesy of Dahlin, D C. Cancer 9 195-203 Jan.-Feb. 1956.)

cates the *variation observed microscopically in tumors* and even in different fields of the same lesion The spectrum included myxomatous appearing zones present in all lesions and predominating in six Myxomatous fields contained variable amounts of collagenous material imparting a fibrous character to some parts This fibrous component was not striking microscopically Chondroid regions present in every tumor varied from tiny scattered foci in three to large zones that dominated the histologic picture in four The latter tumors imitated closely neoplasms belonging to the chondroma-chondrosarcoma group All tumors demonstrated a lobular pattern of growth although this feature

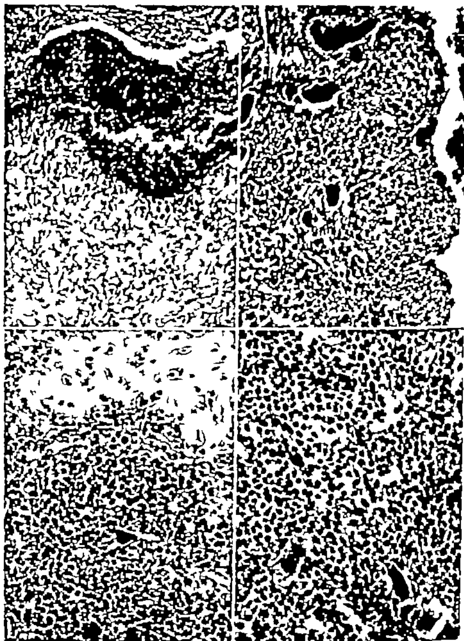


Fig. 40 (top left).—Mixed chondromyxoid fibroma and chondroblastoma of upper part of tibial shaft. Cellular zone characteristic of benign chondroblastoma dominates top part of figure. Hematoxylin-eosin; reduced from ×95.

Fig. 41 (top right).—Chondroblastomatous zone in same neoplasm, showing cellular detail, including multinucleated cells. Hematoxylin-eosin; reduced from ×200.

Fig. 42 (bottom left).—Classic benign chondroblastoma of upper part of humerus, showing histologic similarity to mixed lesions. Hematoxylin-eosin; reduced from ×200.

Fig. 43 (bottom right).—Another pure chondroblastoma, emphasizing similarity of cells to mixed lesions in series. Hematoxylin-eosin; reduced from ×200.

(Courtesy of Dahlin, D. C.: Cancer 9: 195-203, Jan.-Feb., 1956.)

was obscure occasionally in sections prepared from curetted fragments It is important to recognize the increased concentration of nuclei observed at the periphery of the well delimited lobules A relation between benign chondroblastoma and chondromyxoid fibroma was observed Three lesions exhibited an admixture of the two tumor types One was a large tumor of the tibial shaft. Although the bulk of the lesion was typical of chondromyxoid fibroma about 10% of the tissue examined in numerous microscopic sections showed the features of chondroblastoma (Figs 40-43) A recurrent tumor 1 cm in diameter excised from the same region two years after the original curettage, exhibited the same mixture of tumors

The usual treatment in all patients was curettage with or without cautery of the cavity The neoplasm recurred in two patients

► [The grave danger of making an incorrect diagnosis and carrying out treatment on the basis of a study of microscopic sections alone is well emphasized in the instance of the chondromyxoid fibroma and benign chondroblastoma. The clinical history and findings and a careful review of the x rays must be co-ordinated with the study of the pathologic tissue if the clinician is to avoid serious or fatal errors in treatment of bone tumors.—Ed.]

Giant Cell Tumor of Bone Differential Diagnosis According to David C Dahlin Ralph K Ghormley and David G Pugh[5] (Mayo Clinic) the osseous lesions that have been confused most commonly with giant cell tumors include nonosteogenic fibroma, osteogenic sarcoma simple (unicam[illegible] bone cyst giant cell reparative granuloma aneu[illegible]one cyst benign chondroblastoma fibrous dysplasia [illegible] bone lesions of hyperparathyroidism These variants are distinct and unrelated entities

Nonosteogenic fibromas appear most often in late childhood or adolescence and are frequently discovered by x rays incidentally Microscopically the predominant cells are benign appearing fibroblasts and there are variable amounts of intercellular collagen Mitotic figures may be found. Small clusters and even large sheets of lipid laden histiocytes are common Histologic differentiation from giant cell tumor rests chiefly on the fact that the characteristic proliferating stromal cell is distinctly a collagen producing fibroblast.

(5) Proc. Staff Meet. Mayo Clin. 31.31-42, Jan. 25 1956.



Fig. 40 (top left).—Mixed chondromyxoid fibroma and chondroblastoma of upper part of tibial shaft. Cellular zone characteristic of benign chondroblastoma dominates top part of figure. Hematoxylin-eosin; reduced from ×95.

Fig. 41 (top right).—Chondroblastomatous zone in same neoplasm, showing cellular detail, including multinucleated cells. Hematoxylin-eosin; reduced from ×200.

Fig. 42 (bottom left).—Classic benign chondroblastoma of upper part of humerus, showing histologic similarity to mixed lesions. Hematoxylin-eosin; reduced from ×200.

Fig. 43 (bottom right).—Another pure chondroblastoma, emphasizing similarity of cells to mixed lesions in series. Hematoxylin-eosin; reduced from ×200.

(Courtesy of Dahlin, D. C.: Cancer 9: 195-203, Jan.-Feb., 1956.)

was obscure occasionally in sections prepared from curetted fragments It is important to recognize the increased concentration of nuclei observed at the periphery of the well delimited lobules A relation between benign chondroblastoma and chondromyxoid fibroma was observed Three lesions exhibited an admixture of the two tumor types One was a large tumor of the tibial shaft. Although the bulk of the lesion was typical of chondromyxoid fibroma about 10% of the tissue examined in numerous microscopic sections showed the features of chondroblastoma (Figs 40-43) A recurrent tumor 1 cm in diameter excised from the same region two years after the original curettage, exhibited the same mixture of tumors

The usual treatment in all patients was curettage with or without cautery of the cavity The neoplasm recurred in two patients

► [The grave danger of making an incorrect diagnosis and carrying out treatment on the basis of a study of microscopic sections alone is well emphasized in the instance of the chondromyxoid fibroma and benign chondroblastoma. The clinical history and findings and a careful review of the x-rays must be co-ordinated with the study of the pathologic tissue if the clinician is to avoid serious or fatal errors in treatment of bone tumors —Ed.]

Giant Cell Tumor of Bone Differential Diagnosis According to David C Dahlin Ralph K Ghormley and David G Pugh[5] (Mayo Clinic) the osseous lesions that have been confused most commonly with giant cell tumors include nonosteogenic fibroma, osteogenic sarcoma, simple (unicameral) bone cyst, giant cell reparative granuloma aneurysmal bone cyst benign chondroblastoma fibrous dysplasia and bone lesions of hyperparathyroidism These variants are distinct and unrelated entities

Nonosteogenic fibromas appear most often in late childhood or adolescence and are frequently discovered by x rays incidentally Microscopically the predominant cells are benign appearing fibroblasts and there are variable amounts of intercellular collagen Mitotic figures may be found Small clusters and even large sheets of lipid laden histiocytes are common Histologic differentiation from giant cell tumor rests chiefly on the fact that the characteristic proliferating stromal cell is distinctly a collagen producing fibroblast.

(5) Proc. Staff Meet. Mayo Clin. 31:31-42, Jan. 25 1956.

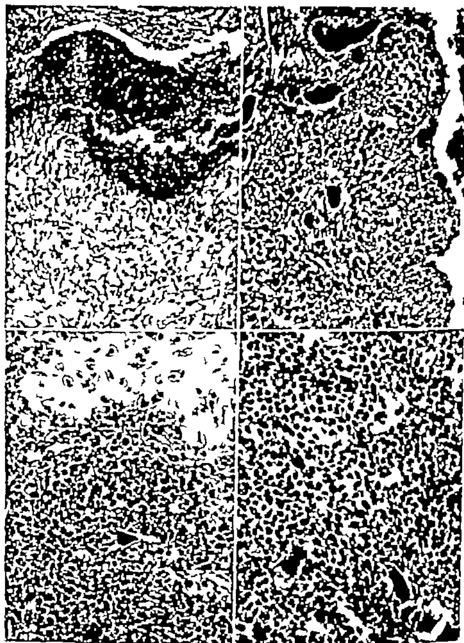


Fig 40 (top left) —Mixed chondromyxoid fibroma and chondroblastoma of upper part of tibial shaft. Cellular zone characteristic of benign chondroblastoma dominates top part of figure Hematoxylin-eosin reduced from ×95

Fig 41 (top right) —Chondroblastomatous zone in same neoplasm, showing cellular detail, including multinucleated cells. Hematoxylin-eosin; reduced from ×200.

Fig 42 (bottom left) —Classic benign chondroblastoma of upper part of humerus, showing histologic similarity to mixed lesions. Hematoxylin-eosin; reduced from ×200.

Fig. 43 (bottom right) —Another pure chondroblastoma, emphasizing similarity of cells to mixed lesions in series. Hematoxylin-eosin reduced from ×200.

(Courtesy of Dahlin, D C. Cancer 9 195-203 Jan. Feb., 1956.)

was obscure occasionally in sections prepared from curetted fragments It is important to recognize the increased con centration of nuclei observed at the periphery of the well delimited lobules A relation between benign chondroblas toma and chondromyxoid fibroma was observed Three lesions exhibited an admixture of the two tumor types One was a large tumor of the tibial shaft Although the bulk of the lesion was typical of chondromyxoid fibroma about 10% of the tissue examined in numerous microscopic sec tions showed the features of chondroblastoma (Figs 40-43) A recurrent tumor 1 cm in diameter excised from the same region two years after the original curettage exhibited the same mixture of tumors

The usual treatment in all patients was curettage with or without cautery of the cavity The neoplasm recurred in two patients

► [The grave danger of making an incorrect diagnosis and carrying out treatment on the basis of a study of microscopic sections alone is well emphasized in the instance of the chondromyxoid fibroma and benign chondroblastoma. The clinical history and findings and a careful review of the x-rays must be co-ordinated with the study of the pathologic tissue if the clinician is to avoid serious or fatal errors in treatment of bone tumors.—Ed.]

Giant Cell Tumor of Bone Differential Diagnosis According to David C Dahlin Ralph K. Ghormley and David G Pugh[5] (Mayo Clinic) the osseous lesions that have been confused most commonly with giant cell tumors include nonosteogenic fibroma, osteogenic sarcoma simple (unicameral) bone cyst giant cell reparative granuloma aneurysmal bone cyst, benign chondroblastoma fibrous dysplasia and bone lesions of hyperparathyroidism These variants are distinct and unrelated entities

Nonosteogenic fibromas appear most often in late childhood or adolescence and are frequently discovered by x rays incidentally Microscopically the predominant cells are benign appearing fibroblasts and there are variable amounts of intercellular collagen Mitotic figures may be found Small clusters and even large sheets of lipid laden histiocytes are common. Histologic differentiation from giant cell tumor rests chiefly on the fact that the characteristic proliferating stromal cell is distinctly a collagen producing fibroblast.

(5) Proc. Staff Meet. Mayo Clin. 31:31-42, Jan. 25 1956.

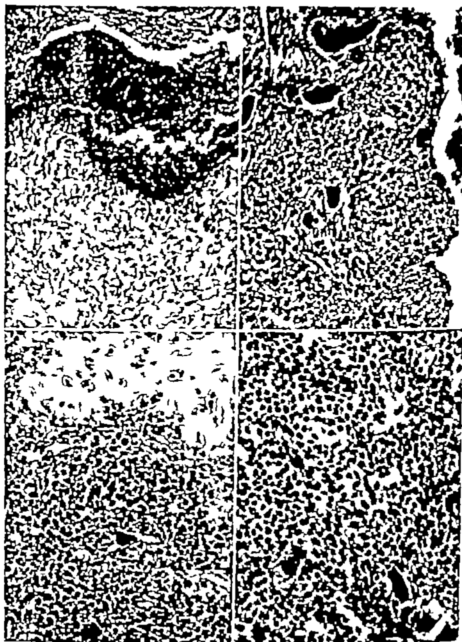


Fig 40 (top left) —Mixed chondromyxoid fibroma and chondroblastoma of upper part of tibial shaft. Cellular zone characteristic of benign chondroblastoma dominates top part of figure Hematoxylin-eosin reduced from $\times 95$

Fig. 41 (top right) —Chondroblastomatous zone in same neoplasm, showing cellular detail, including multinucleated cells. Hematoxylin-eosin reduced from $\times 200$.

Fig 42 (bottom left) —Classic benign chondroblastoma of upper part of humerus, showing histologic similarity to mixed lesions. Hematoxylin-eosin, reduced from $\times 200$.

Fig 43 (bottom right) —Another pure chondroblastoma, emphasizing similarity of cells to mixed lesions in series. Hematoxylin-eosin reduced from $\times 200$

(Courtesy of Dahlin, D C Cancer 9 195-203 Jan. Feb. 1956.)

Biopsy of a focal lesion in hyperparathyroidism reveals fibrous replacement of bone and in the fibrous tissue along with the hemosiderin pigmentation fairly numerous benign giant cells are commonly seen In general the histopathologic characteristics differ from those of giant cell tumor in that the lesions of parathyroid osteopathy are distinctly fibrogenic

► [This article again calls attention to the fact that many pathologists, as well as many orthopedic surgeons are careless about the lesions they call giant cell tumors. There are numerous lesions in which giant cells may be found that are not giant cell tumors The giant cell tumor is a distinct clinical entity and the correct differential diagnosis is most important for treatment.—Ed.]

Myeloplaxic Tumors of Bones or Giant Cell Bone Tumors A Trifaud R Faysse and J Papillon[1] studied 89 cases of myeloplaxic tumor in all of which complete clinical radiologic and histologic records were available [*Dorland's Medical Dictionary* defines myeloplax as any multinuclear giant cell of the bone marrow —Ed] The term myeloplaxic tumor" is an unfortunate choice because the presence of giant cells alone is not enough to justify definition of a pathologic entity Pending adoption of an international terminology which is greatly to be desired the two designations that appear to be indispensable and adequate for differentiation of benign and malignant tumors are (1) myeloplaxic or giant cell tumors and (2) osteolytic giant cell sarcomas On first examination and before any treatment has been given tumors of the first class show unmistakable signs of benignity whereas those of the second are either frankly malignant or not indisputably benign In the beginning however the line between benign and malignant must be clearly drawn so that the surgeon duly briefed by a competent histologist can propose a sensible form of treatment and establish a prognosis with respect to life in which the unforeseen is reduced to the minimum If it is true that about 15% of all bone tumors containing giant cells are malignant, it is obvious that identification of those that are malignant should be made as soon as possible Consequently a complete surgical biopsy with removal of the entire tumor by curettage should be carried out at the beginning If the

(1) Rev chir orthop. 4 413 513 July Sept 1956

Since the average osteogenic sarcoma exhibits extreme anaplasia and lacelike zones of osteoid it can hardly be confused with giant cell tumor Some however are composed of small and fairly regular cells and osteoid production may be minimal When such a tumor contains benign giant cells it may be mistaken for a giant cell tumor Multiple sections reveal the sarcomatous nature of the lesion at the cytologic level

The simple (unicameral) cyst presents pathognomonic gross findings at operation The lining of the cyst wall consists of bare bone a thin fibrous layer or sometimes a fleshy layer several millimeters thick The cystic spaces are full of gas or clear fluid unless fracture has produced hemorrhage Confusion with giant cell tumor occurs in cases in which there is a thick lining which may contain fairly numerous benign giant cells

The giant cell reparative granuloma has a predilection for patients between 10 and 25 The giant cells are usually not numerous and are frequently clumped in areas of hemorrhage Microscopic cysts may be present Trabeculae of osteoid tissue which may show some calcification are frequently present

The gross appearance of an aneurysmal bone cyst permits it to be recognized at operation It consists of a honeycombed mass of various sized blood spaces filled with unclotted blood Occasionally about half of a lesion consists of solid tissue Giant cells may be present and are particularly numerous in the larger solid areas of the tumor

Microscopically many fields from a benign chondroblastoma may appear to be practically identical to those from a true giant cell tumor but more or less prominent zones in which chondroid ground substance is produced permit recognition of the chondroblastoma. These chondroid areas tend to undergo degeneration and subsequent calcification

Fibrous dysplasia is ordinarily not mistaken for giant cell tumor of bone but an occasional lesion may contain foci of benign giant cells frequently near a zone of hemorrhage. Histologic sections usually reveal zones in which the dense fibrous tissue of fibrous dysplasia contains telltale irregular osseous trabeculae or masses of osteoid tissue and sometimes even cartilage

Biopsy of a focal lesion in hyperparathyroidism reveals fibrous replacement of bone and in the fibrous tissue along with the hemosiderin pigmentation fairly numerous benign giant cells are commonly seen In general the histopathologic characteristics differ from those of giant cell tumor in that the lesions of parathyroid osteopathy are distinctly fibrogenic.

► [This article again calls attention to the fact that many pathologists as well as many orthopedic surgeons, are careless about the lesions they call giant cell tumors. There are numerous lesions in which giant cells may be found that are not giant cell tumors The giant cell tumor is a distinct clinical entity and the correct differential diagnosis is most important for treatment.—Ed.]

Myeloplaxic Tumors of Bones or Giant Cell Bone Tumors. A Trifaud R. Faysse and J Papillon[1] studied 89 cases of myeloplaxic tumor in all of which complete clinical radiologic and histologic records were available [*Dorland's Medical Dictionary* defines myeloplax as "any multinuclear giant cell of the bone marrow —Ed] The term myeloplaxic tumor' is an unfortunate choice because the presence of giant cells alone is not enough to justify definition of a pathologic entity Pending adoption of an international terminology which is greatly to be desired the two designations that appear to be indispensable and adequate for differentiation of benign and malignant tumors are (1) myeloplaxic or giant cell tumors and (2) osteolytic giant cell sarcomas On first examination and before any treatment has been given tumors of the first class show unmistakable signs of benignity whereas those of the second are either frankly malignant or not indisputably benign In the beginning however the line between benign and malignant must be clearly drawn so that the surgeon duly briefed by a competent histologist, can propose a sensible form of treatment and establish a prognosis with respect to life in which the unforeseen is reduced to the minimum If it is true that about 15% of all bone tumors containing giant cells are malignant it is obvious that identification of those that are malignant should be made as soon as possible Consequently a complete surgical biopsy with removal of the entire tumor by curettage should be carried out at the beginning If the

(1) Rev chir orthop. 42 413-513 July Sept 1956

tumor is benign such a biopsy will often be all the treatment that is needed

From the anatomic and clinical viewpoint myeloplaxic tumors are solitary lesions Sometimes they develop between the cortex and the periosteum and sometimes by osteolysis they hollow out a cavity within the bone Histologically they present variations corresponding to the varying proportions of the cells of which they are composed About 75% of the tumors appear in the extremities and 25% in the head and spine The lower limbs are affected more often than the upper ones The incidence is highest in the young few patients over age 35 being affected Trauma sometimes precedes the appearance of a myeloplaxic tumor and in certain cases the possibility of a cause and-effect relation cannot be denied Pain and swelling are predominant symptoms and some of the tumors present a pseudoinflammatory appearance that leads to diagnostic errors

The radiologic manifestations like the clinical ones are multiple The subperiosteal tumors present a fairly constant picture and can easily be recognized after they have once been identified (Fig 44) The endo-osseous tumors have been divided into three groups according to the radiologic appearance of their confines (1) intracortical in which the cortex is preserved the trabeculae of the spongiosa are still apparent and the tumor is well delimited (2) intraperiosteal in which the cortex is thin and bulging and the osseous trabeculae are rare and (3) extraperiosteal in which the cortex has disappeared together with the trabeculae of the spongiosa, and the soft parts have been infiltrated. This classification however is inacceptable as regards the third group because the tumors so described are malignant processes differing from myeloplaxic tumors. According to the degree of cortical thinning one can distinguish tumors (1) without cortical involvement (Fig 45) (2) with thinning of the cortex and (3) with rupture of the cortex Small tumors are often eccentric at the outset and limited to a narrow juxtacortical lacuna (Fig 46) while tumors with extensive development may occupy the whole of an epiphysis

Therapeutic indications outlined are based on careful consideration of published works and on the results obtained in







Fig. 44 (above left) —Subperiosteal myeloplaxic tumor.
Fig. 45 (above) —Myeloplaxic tumor without cortical involvement.
Fig. 46 (left) —Juxtasubcortical form.
(Courtesy of Trifaud, A., *et al.* Rev chir orthop 4 413-513 July Sept., 1956.)

the authors own cases No method of treatment should be rejected a priori except radiation in high doses Some methods are generally preferable but the indications for others depend on particular features in certain cases The general indications may be summarized as follows (1) Surgical treatment is to be preferred in most cases because of its efficacy the quality of the functional results and the rapidity with which healing is usually secured Curettage is the procedure most often indicated and when certain precautions are observed it seems to be capable of curing most patients The danger of relapse can be prevented to some extent. Resection is suitable only in certain special cases and amputation is rarely indicated (2) Radiotherapy alone should not be used as a routine measure In well regulated doses it does not seem to be dangerous but it does interfere with a thorough histologic evaluation of the lesion and cures obtained by its means are slow It has proved effective in some of the authors cases but its effectiveness is not constant.

The indications vary greatly according to the site of the tumor Bones of secondary importance should be treated by curettage and grafts whenever possible, but there should be no hesitation about undertaking resection if necessary Tumors affecting the epiphyses of the arm can usually be treated by curettage but the indications for resection in this site are broader Pelvic lesions provide one of the least disputed indications for radiotherapy Combined surgical and radiotherapeutic treatment is favored by some authors in lesions affecting the spine but here again radiotherapy may be used alone in some cases In general recurrences may be treated according to the indications for the initial lesions but the possibility of malignant degeneration must be carefully considered In doubtful cases in which the nature of the lesion cannot be established amputation must not be lightly undertaken It cannot be guaranteed to prevent the worst if the lesion is truly malignant, whereas a wide resection will provide maximum security with minimum mutilation consequently in such cases it is best to let the patient take his chance

► [This article is in effect a monograph dealing with almost every lesion of the bones which contains giant cells. The authors have attempted to differentiate between the benign, which they prefer to call "myeloplaxic tumors," and tumors containing giant cells which present malignant mani

festations. They do not clearly establish as a distinct clinical entity the benign giant cell tumor. Cortical lesions such as those shown (Figs. 44-46) would be classified in the United States as *nonossifying* fibroma and not as giant cell tumors. The mere presence of a number of giant cells in a lesion is not sufficient to call it a giant cell tumor. These authors have made a great effort to try to clarify the confusion which has existed with regard to *diagnosis and treatment, but unfortunately they have not made* their points as clear as might be desired. They have emphasized the importance of histologic examination, and with this we agree. On the other hand, unless the tissue which is examined histologically represents a considerable area or cross-section of the entire tumor mass, it may not be typical of the lesion as a whole and hence a histologic report may be misleading.—Ed.]

Soft Tissue Neoplasms Associated with Congenital Neurofibromatosis are reported by H. R. McCarroll[6] (Washing-



Fig. 47.—Diffuse soft tissue hypertrophy of thigh and leg. (Courtesy of McCarroll, H. R.: J. Bone & Joint Surg. 38-A:717-731, July, 1956.)

ton Univ.). Of the soft tissue neoplasms commonly found with *congenital neurofibromatosis* the cafe au lait spot, nevus lateralis, verrucous type skin hypertrophy and neurofibromatous nodule are of little clinical significance. The diffuse soft tissue hypertrophy, plexiform type neuro-

(6) J. Bone & Joint Surg. 38-A:717-731, July, 1956.

fibromatosis and primary tumors arising in the major nerve components are of major clinical importance. Experience derived from 136 patients indicated that soft tissue neoplasms in this disease may be classified as primary neurogenic tumors and tumors of other soft tissue structures The two may occur simultaneously in the same patient, but in some patients tumefaction of major nerve components may exist independently with minimal involvement of adjacent soft tissue structures

In patients in whom diffuse soft tissue hypertrophy remains relatively isolated and in whom it is limited to a portion of one extremity radical excision of the hypertrophied subcutaneous tissue and involved peripheral nerves may control progress of the disease (Fig 47) In many patients, with a more diffuse type involvement covering an entire extremity or a greater portion of the body, in whom the deeper soft tissue structures and subcutaneous tissue are involved regional surgery may not prevent progression In many instances diffuse flat hemangiomatous changes may be noted and primary or secondary lymphatic involvement may also have occurred Benign or malignant primary tumors may occur in major nerve structures

Desmoid Tumors are locally invasive, reputedly benign neoplasms of fibrous tissue origin Difficulty frequently arises in separating them histologically from fibrosarcomas in borderline cases a clinical course seems to afford the only definite answer These lesions have been reported as arising in association with fascia muscles tendon aponeuroses and related structures They are usually found in the abdominal wall of young parous females and are infrequent elsewhere. Although considered benign they are without a capsule. Wide excision is the treatment of choice Since they are fibrous and invade and involve adjacent fibrous tissues and other similar structures their limits are difficult to establish at operation and remnants may be left in situ—hence their marked tendency to recur Occasionally their extent is so great that complete removal is impossible Microscopically they are composed of whorls of mature fibrous tissue invading splitting up and destroying the adjacent muscle At the periphery the lesions are more cellular and contain inclusions of dead and degenerating skeletal muscle The

most prevalent theory is that they represent the overgrowth of organizing hematomas that have occurred as a result of indirect trauma

J W Fielding[7] (New York) reports on two patients with desmoid tumors

CASE 1.—Boy 15 was hospitalized because of a large, increasing nontender tumor of the left thigh which appeared to invade the deeper structures. It was not attached to the skin. On dissection of the amputated limb the tumor had the appearance of a desmoid tumor and was composed of whorls of interlacing fibrous tissue invading all the muscles on the back of the thigh. Microscopically the peripheral areas revealed muscle inclusions.

CASE 2.—Woman, 25 complained of asymmetry of the buttock of six months duration. A firm, discrete, nontender mass, about 2 in. in diameter appeared to be attached as by a pedicle to the left posterior ilium. The skin over it was freely movable. When the tumor was excised, it showed the same histopathology as that in Case 1

► [There is some argument for the theory that the tumors described in this paper are fibrosarcomas invading muscle. The so-called desmoid tumors are a distinct pathologic entity and not merely a slight variation of the more common fibrosarcoma, which, when it does invade muscle, is not encapsulated or circumscribed. Fibrosarcomas vary widely with respect to cellular activity or mytoses. Metastases from fibrosarcoma are slow in making their presence manifest. Since the desmoid tumor has been declared never to metastasize, although it has all the local manifestations of malignancy it is important that it be correctly diagnosed before sounding the "all-clear" signal. Every orthopedic surgeon should be aware of the fact that there is a lesion known as the desmoid tumor which has all the local characteristics and much of the microscopic appearance of a metastasizing fibrosarcoma but is only locally destructive.—Ed.]

Glomus Tumour These tumors usually occur on the hands and feet. Karam Singh Grewal Prithipal Singh Maini Manmohan Singh and N L. Chitkara[8] (Amritsar, India) report on 10 patients in 3 the tumor was found around the knee, and in 1 four tumors were noted on one thigh

The tumor arises from the hypertrophy of the normal glomus which is widely distributed under the skin all over the body It occurs oftener in males Histopathology shows a conglomeration of blood vessels in the walls of which peculiar cuboid or rounded glomus cells are seen intermingled with smooth muscle cells Usually these cells are arranged in rows and sometimes they obliterate the lumens of blood vessels Occasionally the blood spaces may be so large and so full of red cells that they resemble angiomas in certain sections The tumor is essentially benign and does

(7) New York J Med. 56 1487-1490 May 1 1956.
(8) Indian J Surg 18 43-46 February 1956

not recur after surgical excision as observed in the authors' patients

The main symptom is pain which may be excruciating and may be produced spontaneously It is usually localized though it may radiate up and down the limb like neuralgic pain Locally the tumor may be invisible or just show as a bluish spot under the nail bed but sometimes it is large and easily seen and palpated though the largest diameter seldom exceeds two cm The skin over the tumor is bluish or purplish Tenderness over the tumor is marked Palpable tumors are sharply demarcated but are not movable under the skin Differential diagnosis includes neurofibroma melanoma and angioma

A painful nodule under the skin and even spontaneous pain in a localized spot should be regarded as glomus tumor *unless proved otherwise*

► [The glomus tumor is an angioneuroma. All these tumors contain a "conglomeration of blood vessels and nonmedulated nerve fibers." The extreme sensitivity to any pressure or touch suggests that there must be within the tumor area itself highly sensitive pain sensory nerve endings.—Ed.]

Glomangioma of Left Thumb is discussed by Paul Brand and Ernest B Sundaram[9] (Vellore South India) The normal glomus by controlling arteriovenous circulation *within* the extremities can regulate both local and general body temperatures through the dissipation or conservation of heat It measures 22-60μ. Glomic units are most common in the nail bed and finger tip and in the palmar and plantar aspects of the extremities

Glomic tumors are commonly found in the extremities near the digits The average tumor 1 cm in diameter consists of a tangled mass of blood vessels well surrounded by a fibrous capsule and presenting the various elements found in the normal glomus viz endothelial lining glomus cells, *plain muscles and nonmedullated nerve fibers*

The typical tumor is associated with a long history of pain This is usually shocklike starts at the site of the tumor and may radiate up the arm or remain localized. It may be relieved spontaneously or sometimes by putting the finger in warm water X rays reveal a smooth concave deformity of the dorsum or the sides of the distal phalanx but there may be a punched-out defect in the tuft Margins are

(9) Indian J S rg 18:37-42, February 1956.

smooth and while the cortical bone may be eroded a narrow margin of dense bone is preserved sometimes the bone underlying the tumor shows eburnation Treatment consists of excision which should be complete to prevent recurrence.

Hemangiomatosis of Skeleton and Spleen. This rare condition was observed by Gorton Ritchie and Francis G Zeier[1] (Milwaukee Children s Hosp)

Boy 2, was hospitalized because of pain in right ankle and limping after a fall. Five months previously he had been treated for a fractured clavicle which had been discovered incidentally by the



Fig 48.—Note multiple unilocular and multilocular cystic lesions in bones of both legs. Cortices are intact, but there has been local expansion of bones. Some trabeculation is present in lesions. (Courtesy of Ritchie, G., and Zeier F G.: J Bone & Joint Surg 38-A:115-122, January 1956.)

(1) J Bone & Joint Surg. 38-A 115-122, January 1956.

mother with no history of an injury The fracture had healed promptly During the succeeding months he had complained vaguely of urinary frequency

Physical examination revealed an apparently healthy well developed boy Splenomegaly and some enlargement of distal end of the right tibia were noted. Needle biopsy revealed hyperplastic bone marrow The hemogram showed slight hypochromic anemia. X rays disclosed multiple irregular multilocular and monolocular cystic lesions generally distributed throughout the skeleton, except in the



Fig 49 —Cystic angiomatosis of spleen. Gross specimen resembles a cirrhotic liver or polycystic kidney (Courtesy of Ritchie C., and Zeier F G. J Bone & Joint Surg 38-A 115-122 January 1956.)

epiphyses and the bones of the hands and feet (Fig 48) Retrograde pyelograms revealed hydronephrosis

On biopsy of the right tibia, the cortex over one of the lesions was thin and brittle but intact. It showed increased vascularity and, when tapped produced a hollow sound. The marrow of the involved bone was replaced by a poorly organized sinus filled with blood.

At laparotomy the liver and kidneys appeared to be normal but the spleen was at least eight times normal size and contained multiple cystic tumors (Fig 49) One of the cystic nodules was aspirated with the spleen in situ, and a yellowish fluid was obtained. A splenectomy was performed. Recovery was uneventful Diagnosis was hemangiohamartoma of the spleen.

Histiocytic Tumors of Tendon Sheaths A Rubens Duval[2] (Paris) states that these small benign tumors which occur

(2) Semaine hôp Paris 31 4059-4064 Dec. 20 1955

with equal frequency in the sexes may appear at any age but are commonest between 30 and 50 Although they may be found along the course of most of the tendon sheaths in about 65% of the cases they occur on the palmar aspect of the thumb or the other fingers more rarely they appear on the palm or on the back of the hand or along the lateral peroneal extensors or the extensors of the toes They grow so slowly and cause so little inconvenience that the patient rarely seeks advice until four or five years have elapsed Excision which is usually advised proves definitive, except when local recurrence follows incomplete removal

The histogenetic problems posed by these tumors and the comparative polymorphism of their microscopic structure have been responsible for a good deal of confusion in both terminology and interpretation Thus they have been described as benign synoviomas giant cell tumors fibroxanthomas and histiocytomas and have been successively regarded as true neoplasms angiomas modified by reactional sclerosis and hyperplastic proliferations of an inflammatory character Recent advances in histochemistry however have suggested a different interpretation the lesions appear to be macrophagic granulomas provoked by degradation products of collagen fibers

A comparative study of their histogenesis and histochemistry not only provides a valid interpretation of these tumors but also clarifies a part of the pathology of the tendinous and aponeurotic tissues These tissues are actually highly developed and highly specialized varieties of connective tissue consisting almost entirely of collagen fibers solidly united by their own cohesiveness and by the interposition of widely dispersed cement substances so that the fibrous structures possess great strength and remarkable functional adaptation Nevertheless they are poor in fibrocytes, their irrigation is precarious and they are thus unable by themselves to repair any injuries they may accidentally sustain The delicate molecular structure of collagen and cement substances can be disturbed not only by tears and rupture but also by repeated partial microtraumas Degradation products of the connective framework stagnate in these poorly vascularized tissues and give rise by their causticity to further changes The resulting granulomas

mother with no history of an injury The fracture had healed promptly During the succeeding months he had complained vaguely of urinary frequency

Physical examination revealed an apparently healthy well devel oped boy Splenomegaly and some enlargement of distal end of the right tibia were noted. Needle biopsy revealed hyperplastic bone marrow The hemogram showed slight hypochromic anemia. X rays disclosed multiple irregular multilocular and monolocular cystic le sions generally distributed throughout the skeleton, except in the



Fig 49 —Cystic angiomatosis of spleen. Gross specimen resembles a cirrhotic liver or polycystic kidney (Courtesy of Ritchie G. and Zeler F G. J Bone & Joint Surg. 38-A 115-122, January 1956.)

epiphyses and the bones of the hands and feet (Fig 48) Retrograde pyelograms revealed hydronephrosis

On biopsy of the right tibia, the cortex over one of the lesions was thin and brittle but intact. It showed increased vascularity and, when tapped, produced a hollow sound. The marrow of the involved bone was replaced by a poorly organized sinus filled with blood.

At laparotomy the liver and kidneys appeared to be normal, but the spleen was at least eight times normal size and contained mul tiple cystic tumors (Fig 49) One of the cystic nodules was aspirated with the spleen in situ and a yellowish fluid was obtained A splenec tomy was performed. Recovery was uneventful Diagnosis was hemangiohamartoma of the spleen.

Histiocytic Tumors of Tendon Sheaths. A Rubens-Duval[2] (Paris) states that these small benign tumors which occur

(2) Semaine hôp Paris 31 4059-4064 Dec 20 1955

with equal frequency in the sexes may appear at any age but are commonest between 30 and 50 Although they may be found along the course of most of the tendon sheaths in about 65% of the cases they occur on the palmar aspect of the thumb or the other fingers more rarely they appear on the palm or on the back of the hand or along the lateral peroneal extensors or the extensors of the toes They grow so slowly and cause so little inconvenience that the patient rarely seeks advice until four or five years have elapsed. Excision which is usually advised proves definitive, except when local recurrence follows incomplete removal

The histogenetic problems posed by these tumors and the comparative polymorphism of their microscopic structure have been responsible for a good deal of confusion in both terminology and interpretation Thus they have been de scribed as benign synoviomas giant cell tumors fibroxan thomas and histiocytomas and have been successively re-garded as true neoplasms angiomas modified by reactional sclerosis and hyperplastic proliferations of an inflammatory character Recent advances in histochemistry however, have suggested a different interpretation the lesions appear to be macrophagic granulomas provoked by degradation prod ucts of collagen fibers

A comparative study of their histogenesis and histochem istry not only provides a valid interpretation of these tu mors but also clarifies a part of the pathology of the tendi nous and aponeurotic tissues These tissues are actually high ly developed and highly specialized varieties of connective tissue consisting almost entirely of collagen fibers solidly united by their own cohesiveness and by the interposition of widely dispersed cement substances so that the fibrous structures possess great strength and remarkable func-tional adaptation Nevertheless they are poor in fibrocytes their irrigation is precarious and they are thus unable by themselves to repair any injuries they may accidentally sus tain The delicate molecular structure of collagen and ce ment substances can be disturbed not only by tears and rupture but also by repeated partial microtraumas Degra-dation products of the connective framework stagnate in these poorly vascularized tissues and give rise by their causticity to further changes The resulting granulomas

assume a macrophagic character to assure resorption of the noxious substances Thus it can be seen that there is a structural analogy between tenosynovial lesions articular or dermal since they affect though in different locations comparable fibrous structures which because of their functions are equally subject to frequent injury

Pigmented Villonodular Synovitis Clinical and Pathologic Study The lesion may affect the entire joint or may present as a focal tumor in an otherwise normal synovium Evidence indicates that the tumor commonly called xanthoma or benign synovioma of tendon sheaths ' is only a different manifestation of the proliferative process in classic diffuse pigmented villonodular synovitis About 100 examples of pigmented villonodular synovitis of joints have been reported All lesions were in the lower extremity The cause and nature of pigmented villonodular synovitis and these related conditions are still unknown

William G Atmore David C Dahlin and Ralph G Ghormley[3] report on 34 patients average age 38 5 years The female sex preponderance was 23 11 The lesion was articular in 32 and limited to the popliteal bursae in 2 Nearly 50% had a history of trauma Average duration of symptoms was 6½ years Pain was reported by all patients With one exception swelling of the involved joint usually at onset of clinical symptoms was noted in all patients with knee or ankle involvement 21 patients had limitation of motion X rays were positive in two thirds of the diffuse lesions of the knee or ankle None of the lesions became malignant.

Mitotic activity may be prominent in parts of the lesions. However the combination of iron containing cells lipid containing cells and benign multinucleated cells labels the condition benign As complete surgical extirpation as possible should be attempted Postoperative radiation may be advisable especially in management of recurrent lesions.

Chondrosarcoma of Proximal Portion of Femur Treated by Resection and Bone Replacement Six Year Result is reported by Vernon P Thompson and Clair T Steggall[4] (Los Angeles)

(3) Minnesota Med. 39 196-202, April, 1956.
(4) J Bone & Joint Surg. 38 A 357 367 April, 1956.

Woman, 20 was hospitalized because of pain in the left thigh and knee. There was tenderness over the upper portion of the left thigh and the leg was 2.5 cm. longer than the other Values for serum calcium, phosphorus and alkaline phosphatase were normal. X rays revealed a sharply defined radiolucent, expansile lesion of the femoral head femoral neck and intertrochanteric region. Biopsy specimens revealed chondrosarcoma.

The proximal 16 cm. of the left femur was resected in one piece together with the soft tissue attachments of tendons and muscles biopsy operative area, entire hip joint capsule and ligamentum teres. The cortical biopsy window had not healed. Sections revealed several foci of chondrosarcoma. The denuded bone specimen was autoclaved for 30 minutes In further curettement, the neck broke off easily at its base. A trough was made through the cortex extending from the intertrochanteric space to 3 cm. above the end of the femoral shaft. The specimen was rotated so that the trough and lesser trochanter faced laterally shaft ends were joined by crisscross screws, and the greater trochanter was placed in the denuded acetabulum.

A year after resection and placement of the autoclaved specimen as a graft, a fresh autogenous tibial bone graft was firmly set in a bed of vascular bone extending from the ilium across the hip joint and the fractured graft to 1.5 cm. above the united shaft junction. Sections of the year old autoclaved graft revealed no evidence of chondrosarcoma.

Six years later there was no soft tissue recurrence. X rays showed further maturation of the cancellous cortical and medullary pattern of the bone grafts and arthrodesed hip The left hip became fused.

The autoclaved specimen was used as the initial replacement graft because it was structurally perfect for the situation and easily secured to the distal shaft by only two screws and could be relied on to maintain length for sufficient time to permit determination of the relative degree and location of revascularization absorption and new bone formation

This case demonstrates that the biopsy field must be regarded as part of the tumor area and that the surgeon can not be too generous in allowing a safe margin of resection

Sarcoma of Bone Observations on 150 Cases, with Special Reference to Incidence Location and Pathology were made by M V Sirsat[5] (Bombay) Bone sarcoma was found to be primarily a disease of the young 42% of the patients in the series being under 20 Men were affected more often than women History of trauma was obtained in 30% The outstanding symptoms were pain and swelling The lesions

(5) Indian J Surg. 18:1 30 February 1956.

showed a marked predilection for the ends of the long bones Diagnosis was based on the characteristic clinical x ray and histologic findings Destruction of the bone was a consistent x ray finding There were no typical appear ances as such of the lesion

Ewing's sarcoma formed 44% of the primary malignant bone tumors The average age of the patient was 20 6 years In 50% of Ewing s sarcoma the lesion presented in the bones of the pelvic girdle and the lower extremity In only 9% was the shaft of the long bones affected

Of 42 osteogenic sarcomas, 64 3% were in the lower ex tremity In 21 patients, diagnosis was made by x ray The changes of bone destruction and bone formation were usu ally observed simultaneously in a single bone The sun ray appearance and the reactive triangle of Codman were con sidered typical of osteogenic sarcoma

According to Johnson all bone tumors have a common biochemical character and cytologic expressions of matrix formation and conform to the regional variations in the structure of normal bone Bone tumors could be classified according to capacity for duplicating normal matrix forma tion In a survey of bone tumors in regard to age location and frequency of occurrence Johnson found that they be- have in an orderly and predictable manner What is called the osteoblast and the osteoclast can be the same cell since they may change rapidly from one morphologic type to an other without intervening cell division When bone tumors are classified against this background the behavior pattern of each group seems to fall somewhere along the full cycle from normal matrix synthesis to matrix digestion

Chondrosarcoma, Surgical and Pathologic Problem Re- view of 212 Cases David C Dahlin and Edward D Hender- son[6] (Mayo Clinic and Found) analyzed 212 cases of chon drosarcoma of the trunk and extremities in which surgical procedures have been performed More than half of the tu mors occurred in the pelvic girdle and ribs 84% were found in the trunk and the upper ends of the femora and humeri Peak incidence was in adulthood and old age Local pain and swelling alone or in combination were the usual pre

(6) J Bone & Joint Surg 38-A 1025-1038, October 1956.

senting complaints Good evidence of metastasis was obtained in less than 10%

X rays commonly show destruction of bone and mottled calcification at the involved site Many of the central tumors of long bones produce a fusiform expansion of the shaft associated with thickening of the cortex. Chondrosarcomas that do not involve the medullary cavity may show only slight peripheral cortical destruction or none at all but they usually contain minute or massive telltale calcific masses

The authors graded the malignancy of the tumors observed 1 3 on the basis of their cytologic appearance. Nuclear *pleomorphism hyperchromatism* and increased number of multinucleated cells were the important features indicative of greater cytologic activity Of the 212 tumors 54.7% were grade 1 and 6 1% were grade 3

As judged by a 10 year survival rate adequate surgery resulted in a successful outcome in 41% of the patients traced.

Implantation of the sarcomas was the usual cause of recurrence in the patients treated inadequately In other patients implantation occurred in biopsy or other incisions

Of 58 patients who received x ray therapy 15 seemed to derive definite benefit in that the tumors regressed in size and the symptoms were somewhat relieved However in none of these did x ray treatment alter the ultimate course of the disease

Ewing's Sarcoma Its Roentgen Classification and Diagnosis Robert S Sherman and Kenneth Y Soong[7] (Memorial Center New York) reviewed the x ray appearance of 111 Ewing s sarcomas proved histologically in 77 males and 34 females aged 7 months to 36 years The tumor occurred most commonly in long bones Though no tumors were seen in the skull mandible or vertebra metastases were found in all parts of the skeleton The x ray appearance of the lesion in the long bones varied greatly with only 29 of the 63 cases considered as presenting a classic picture

In the typical central diaphysial location the tumor is

(7) Radiology 66 529 539 April, 1956.

showed a marked predilection for the ends of the long bones Diagnosis was based on the characteristic clinical x ray and histologic findings Destruction of the bone was a consistent x ray finding There were no typical appearances as such, of the lesion

Ewing's sarcoma formed 44% of the primary malignant bone tumors The average age of the patient was 20 6 years In 50% of Ewing s sarcoma the lesion presented in the bones of the pelvic girdle and the lower extremity In only 9% was the shaft of the long bones affected

Of 42 osteogenic sarcomas 64.3% were in the lower extremity In 21 patients diagnosis was made by x ray The changes of bone destruction and bone formation were usually observed simultaneously in a single bone The sun ray appearance and the reactive triangle of Codman were considered typical of osteogenic sarcoma

According to Johnson all bone tumors have a common biochemical character and cytologic expressions of matrix formation and conform to the regional variations in the structure of normal bone Bone tumors could be classified according to capacity for duplicating normal matrix formation In a survey of bone tumors in regard to age location and frequency of occurrence Johnson found that they behave in an orderly and predictable manner What is called the osteoblast and the osteoclast can be the same cell since they may change rapidly from one morphologic type to another without intervening cell division When bone tumors are classified against this background the behavior pattern of each group seems to fall somewhere along the full cycle from normal matrix synthesis to matrix digestion

Chondrosarcoma Surgical and Pathologic Problem Review of 212 Cases. David C Dahlin and Edward D Henderson[6] (Mayo Clinic and Found) analyzed 212 cases of chondrosarcoma of the trunk and extremities in which surgical procedures have been performed More than half of the tumors occurred in the pelvic girdle and ribs 84% were found in the trunk and the upper ends of the femora and humeri Peak incidence was in adulthood and old age Local pain and swelling alone or in combination were the usual pre-

(6) J Bone & Joint Surg. 38-A 1025-1038 October 1956.

senting complaints Good evidence of metastasis was obtained in less than 10%

X rays commonly show destruction of bone and mottled calcification at the involved site Many of the central tumors of long bones produce a fusiform expansion of the shaft associated with thickening of the cortex. Chondrosarcomas that do not involve the medullary cavity may show only slight peripheral cortical destruction or none at all, but they usually contain minute or massive telltale calcific masses

The authors graded the malignancy of the tumors observed 1-3 on the basis of their cytologic appearance Nuclear pleomorphism, hyperchromatism and increased number of multinucleated cells were the important features indicative of greater cytologic activity Of the 212 tumors 54.7% were grade 1 and 6 1% were grade 3

As judged by a 10 year survival rate, adequate surgery resulted in a successful outcome in 41% of the patients traced

Implantation of the sarcomas was the usual cause of recurrence in the patients treated inadequately In other patients implantation occurred in biopsy or other incisions

Of 58 patients who received x ray therapy 15 seemed to derive definite benefit in that the tumors regressed in size and the symptoms were somewhat relieved However in none of these did x ray treatment alter the ultimate course of the disease

Ewing s Sarcoma Its Roentgen Classification and Diagnosis. Robert S Sherman and Kenneth Y Soong[7] (Memorial Center New York) reviewed the x ray appearance of 111 Ewing s sarcomas proved histologically in 77 males and 34 females aged 7 months to 36 years The tumor occurred most commonly in long bones Though no tumors were seen in the skull mandible or vertebra metastases were found in all parts of the skeleton The x ray appearance of the lesion in the long bones varied greatly with only 29 of the 63 cases considered as presenting a classic picture

In the typical central diaphysial location the tumor is

(7) Radiology 66 529-539 April, 1956.

characterized by long extent of the new growth usually in volving about a third of the shaft fusiform configuration frequent involvement of soft parts fine patchy internal pattern of bone destruction ill defined edges and a parallel form of periosteal reaction The onion peel or laminated



Fig. 50 (left) —Sclerotic central metaphysial type Ewing sarcoma.
Fig 51 (right) —Lytic form of central metaphysial Ewing's sarcoma.
(Courtesy of Sherman R. S. and Soong K.) *Radiology 66:529-539 April, 1956.)*

periosteal reaction in Ewing's sarcoma has been overemphasized If present Ewing's tumor should be considered Some cortical destruction was the rule. The most characteristic feature of cortical diaphysial type Ewing's tumor is cortical erosion of varying degree involving the outer surface of the cortex while the inner surface remains intact. In six patients the tumor had a central metaphysial location Among them there were two predominantly sclerotic

(Fig 50) two mixed and two lytic (Fig 51) sarcomas Pathologic fracture was noted in one instance.

X ray findings of Ewing's tumor in the small tubular bones were essentially the same as those in long bones The most striking feature of Ewing's tumor in the rib was a spherical intrathoracic mass of water density associated with the bone lesion Ewing's sarcoma in the flat bones offered no findings that could be depended on for x ray *identification*

► [Many pathologists are hesitant to accept a diagnosis of Ewing's sarcoma when the lesion is obviously a bone building more than a bone-destroying malignancy Despite the onion peel lamination of new bone formed about the central metaphysial lesion in the proximal third of the tibia, I am skeptical about the diagnosis. Study of the gross and microscopic pathology of a generous section of the lesion would be necessary to establish it as a Ewing's sarcoma and not a true osteogenic osteoblastic malignancy —Ed.]

Conditions for Diagnosis of Osseous Reticulosarcomas (Ewing's Tumors) M Guilleminet J Feroldi P Morel and D Germain[8] (Lyons) discuss successive stages in the diagnosis of reticulosarcomas of bone on the basis of experience with 13 cases The prognosis for patients with these tumors is so grave that the diagnosis should not be made unless it can be established beyond doubt. On the whole diagnosis should be based on clinical and radiologic data supported by biopsy Significant information may also be provided by blood studies The close similarity between these tumors and many other diseases of bone and the fact that they are less rare than they were formerly thought to be often leads to the question of their differential diagnosis Errors are frequently made in one series of 27 cases described as Ewing's sarcoma, 10 were misdiagnosed The consequences of such errors are serious

Clinical findings indicative of osseous reticulosarcoma are (1) the patient's age which in this series ranged from 3 to 27 years with an average of 14 years (2) a history of trauma though this may be merely revelatory or aggravating rather than causative (3) spontaneous pain of the kind characteristic of malignant osseous lesions (4) swelling and (5) enlargement of lymph nodes which occurred in four patients but was not characteristic Although the general condition is relatively unimpaired during the early

(8) Rev orthop. 41-683-06, Oct. Dec., 1955

stages the patient is often febrile or subfebrile suggesting infection The clinical picture as a whole with its strongly pseudoinfectious semeiology strongly suggests osteomyelitis Pathologic fractures are rare Metastases however are frequent in six patients they appeared in one or both lungs and in six in other bones

The classic radiologic picture of Ewing s sarcoma, with its imbricated osseous lamellae (onion bulb) is far from being the only one Osteolysis condensation bone spicules and periostic spurs combine in every case to confuse the diagnosis by their variety Nevertheless the radiologic aspects can be classified according to the anatomical variety of the bone its texture and the portion first involved In this series early osteolysis always predominated in the flat bones in the long bones with a thin cortex (Figs 52 and 53) the diaphysial structure was disrupted throughout its length and the dissociated lamellae in the peripheral area showed partial lysis and in the long bones with a thick cortex the process was either diaphysial or metaphysial In the rarer metaphysial form found in 4 patients osteolysis predominated In the diaphysial form the pictures varied as a result of variation in the periosteal reaction but extensive condensation of the thickened cortex was frequently seen These findings suggest that osseous reticulosarcoma has a condensing character in its early stages and that osteolysis follows when the bone has been isolated by the tumor process An important element is the constant appearance of a tumor shadow always large even when bone changes are slight. Such a shadow has great diagnostic significance because osteomyelitic processes are not accompanied by shadows in the soft parts

When it is impossible to distinguish between reticulosarcoma and osteogenic sarcoma on the basis of clinical and radiologic examination alone biopsy is needed The biopsy specimen must be obtained before radiotherapy is given however for accurate histologic interpretation Histologic findings in these cases were in accordance with the criteria established by Oberling because cases not meeting these criteria were excluded.

Reticulosarcomas are radiosensitive, but the improvement obtained by radiotherapy is temporary Average survival in



Fig. 52 (left). —Reticulosarcoma of right fibula, with extensive osteolysis of superior half of diaphysis. Tumor shadow is clearly able.

Fig. 53 (right). —Two months after radiotherapy, recalcification of bone can be seen, but many geodes are present. Tumor shadow has greatly diminished.

(Courtesy of Guilleminet, M., et al. Rev. orthop. 41:683-706, Oct.-Dec. 1955.)

stages the patient is often febrile or subfebrile suggesting infection The clinical picture as a whole with its strongly pseudoinfectious semeiology strongly suggests osteomyelitis Pathologic fractures are rare. Metastases however are frequent in six patients they appeared in one or both lungs and in six in other bones

The classic radiologic picture of Ewing s sarcoma with its imbricated osseous lamellae (onion bulb) is far from being the only one Osteolysis condensation bone spicules and periostic spurs combine in every case to confuse the diagnosis by their variety Nevertheless the radiologic aspects can be classified according to the anatomical variety of the bone its texture and the portion first involved. In this series early osteolysis always predominated in the flat bones in the long bones with a thin cortex (Figs 52 and 53) the diaphysial structure was disrupted throughout its length and the dissociated lamellae in the peripheral area showed partial lysis and in the long bones with a thick cortex the process was either diaphysial or metaphysial In the rarer metaphysial form found in 4 patients osteolysis predominated In the diaphysial form the pictures varied as a result of variation in the periosteal reaction but extensive condensation of the thickened cortex was frequently seen These findings suggest that osseous reticulosarcoma has a condensing character in its early stages and that osteolysis follows when the bone has been isolated by the tumor process An important element is the constant appearance of a tumor shadow always large even when bone changes are slight. Such a shadow has great diagnostic significance, because osteomyelitic processes are not accompanied by shadows in the soft parts

When it is impossible to distinguish between reticulosarcoma and osteogenic sarcoma on the basis of clinical and radiologic examination alone biopsy is needed The biopsy specimen must be obtained before radiotherapy is given however for accurate histologic interpretation Histologic findings in these cases were in accordance with the criteria established by Oberling because cases not meeting these criteria were excluded

Reticulosarcomas are radiosensitive but the improvement obtained by radiotherapy is temporary Average survival in

Fig. [illegible] (left).—[illegible] with [illegible] extensive [illegible] of superior half of [illegible]. Tumor shadow [illegible]

Fig. 33 (right).—[illegible] of bone can be seen but [illegible] are present. [illegible]

(Courtesy [illegible] 1955.)

seven patients treated with radiotherapy alone was 9 months in three treated with radiotherapy and resection or amputation it was 16 months and in two of three treated with radiotherapy and carvolysine it was 16 and 23 months while the third is still alive and well with a follow up of almost 4 years

► [The similarity between the clinical course of some malignancies and some low grade infections has been reported. The principal difference lies in the fact that patients recover from most of the infections. The low grade intermittent fevers associated with eosinophilic granuloma, reticulum cell sarcoma, Hodgkin's disease, lymphosarcoma and the leukemias have caused a number of investigators to suggest that a virus infection might be the etiologic factor Recent reports of several investigators have brought out evidence indicating that some of the leukemias are produced by a virus infection The authors emphasize what they call the "pseudo-infectious semeiology" of the reticulum cell sarcomas. Time and further research may show that this infectious semeiology is more real than pseudo.—Ed.]

Round Cell Tumors of Bone were reviewed by George Lumb and D H Mackenzie[9] (Westminster Hosp London) in 23 cases metastatic carcinoma and myeloma were excluded

In Ewing's tumor histologic examination reveals sheets of small polyhedral cells with pale cytoplasm small hyperchromatic nuclei well defined cell borders and complete absence of intercellular material (Fig 54) In primary reticulum cell sarcoma the essential component is the reticulum cell which is two to four times the size of a lymphocyte has abundant pale staining cytoplasm well defined nucleus and nucleoli and an easily recognizable chromatin network. Binucleated cells may occur but true Sternberg Reed cells are not seen The stroma is loose and vascular Reticulin fibers may encase individual cells or may surround small groups (Fig 55)

In many but not all cases of neuroblastoma the cells are grouped in rosette like clusters within which neurofibrils can be seen It should be stressed that particularly in biopsy material rosettes may be absent. Convincing rosette formation was observed in bone in only one of the five proved cases of neuroblastoma in the authors series whereas it was frequently encountered in soft tissue metastases It is also possible that cell size may be influenced by environment. The cell size and appearance are important in at

(9) Brit. J Surg 43 3 0-389 January 1956.

tempting to distinguish reticulum cells from those occurring in Ewing's tumor In neuroblastoma reticulin is scanty (Fig 56) The authors believe that a primary round cell tumor of bone that can be differentiated from myeloma and reticulum cell sarcoma exists

In bone biopsy when sheets of typical reticulum cells and the characteristic reticulin pattern are seen diagnosis

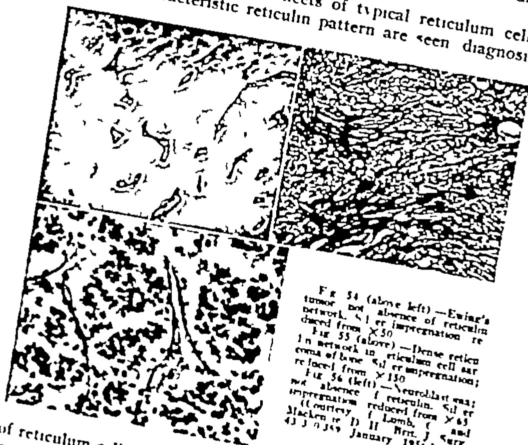


Fig 54 (above left) —Ewing's tumor not absence of reticulin network. Silver impregnation reduced from ×50

Fig 55 (above) —Dense reticulin network in reticulum cell sarcoma of bone Silver impregnation; reduced from ×150

Fig 56 (left) —Neuroblastoma; not absence of reticulin. Silver impregnation reduced from ×65 (Courtesy of Lumb, G and Mackenzie D H Brit. J Surg 43 J n 359 January 1956)

of reticulum cell sarcoma can be made Perithelial arrangement with necrosis cannot be regarded as a specific property of Ewing's tumor but in absence of positive evidence of neuroblastoma or reticulum cell sarcoma should suggest the diagnosis Biopsy specimens that show an anaplastic round cell tumor with no characteristic features are occasionally seen

Malignant Giant Cell Tumor of Bone is reported by Arthur K Gregory and Arthur W Wright (Albany Med College) Giant cell tumor of bone is a locally destructive lesio

which tends to recur but is generally benign without metastasis Occasionally one is frankly malignant when first examined and some may become malignant over a number of years The lesion is considered a neoplasm of specific type



Fig 57 (top) —Section of original biopsy taken in 1932 showing typical benign giant cell tumor of bone
Fig 58 (bottom) —Section of biopsy taken in 1940 showing atypical characteristics of malignant transformation of originally benign tumor
(Courtesy of Gregory A. R. and Wright A. W New York M. J 55:3269-3274 Nov 15 1955)

containing spindle-shaped round or oval stromal cells which apparently arise from the undifferentiated supporting connective tissue of the marrow Giant cells are irregularly distributed among the stromal cells The neoplasm develops in the epiphysis or epiphysial end of the diaphysis and is eccentric enlarging and expanding the bone itself

and often reducing the cortex to a thin shell which may fracture Spongiosa is usually destroyed and replaced

Man, 35 injured his right knee. X rays three weeks later showed destruction of the distal femur a thin cortex, pathologic fracture and condyles over riding the shaft. Biopsy showed typical giant cell tumor of bone, grade I The neoplasm was composed of round, spindle or polyhedral stromal cells together with characteristic foreign body giant cells of slightly varying shape (Fig 57)

He received three treatments of radiation therapy quantity unknown at 4 to 5 week intervals during the following three months With a Thomas splint and traction, the fracture soon united. Eight years later the patient now 43 had pain in this same region and examination revealed extension into the soft tissues Biopsies were characteristic of a malignant giant cell tumor of bone, grade III The neoplasm was now composed of atypical actively growing cells of three general morphologic types although bizarre forms were also present (Fig 58)

A total of 4,590 r 18 doses of 255 r each was given during one month and the leg amputated at midthigh. Postoperatively he had chest pain hemoptysis and an x ray shadow which was increasing in size Three years later he was readmitted with the chief complaint of hemoptysis and coughed up a fragment of necrotizing sarcomatous tissue resembling the malignant bone tumor removed Chest films showed large sharply demarcated dense shadows He developed the Pancoast syndrome and died. At necropsy he had multiple neoplastic metastases in the lungs secondary to the malignant neoplasm in the femur

Spontaneous malignant transformation of these neoplasms is rare Radiation therapy used to destroy the neoplastic tissue may be stimulative rather than suppressive and it is possible that this giant cell tumor may have been transformed to a malignant type in part at least by radiation

So-called Solitary Plasmocytoma of Bone Ivan Yentis* (Middlesex Hosp London) reports on five patients aged 34-55 with solitary bone plasmocytoma In four multiple lesions developed after 20 months to 12 years

Histology affords no help in differentiation between solitary and multiple myeloma of bone and presence of Bence Jones proteinuria is an unreliable index of the extent of marrow involvement in myelomatosis When present it is intermittent at first becoming constant only in the terminal stage A repeatedly negative result is still compatible with widespread osseous deposit

[illegible]

The author believes that the solitary plasmocytoma of bone is a rare clinical variant of multiple myeloma In no instance is it possible to give an accurate prognosis Neither radiotherapy nor surgery seems to prevent ultimate development of widespread lesions

The lesions may become very large before they are dis



Fig 59 —Coarsely trabeculated multicystic myeloma of left upper femur with pathologic fracture. Fracture now united following radiotherapy (Courtesy of Yentis, I J Fac. Radiologists 8 132 144 October 1956.)

covered They occur mostly in the upper femur ilium and vertebrae They are purely osteolytic arising in the medulla and involving the cortex by outward spread Pathologic fracture is common When further bone lesions eventually occur they are usually identical with those characteristic of multiple myeloma viz small rounded punched-out defects but large areas of medullary and cortical destruction may develop Two radiologic varieties occur viz the trabeculated type (Fig 59) resembling an osteoclastoma, and the

nontrabeculated type simulating an osteolytic secondary.

Liposarcoma of Bone is reported by Edith K. Dawson (Edinburgh)

Woman, 28, complained of pain and swelling of the left lower thigh after mild trauma to the knee five weeks previously. On examination, there was broadening of the lower end of the left thigh with added fulness on the anteromedial aspect. Palpation revealed enlargement of the lower half of the femur with several hard, rounded masses outside and apparently directly connected with the



Fig 60 (left).—X-ray [illegible] femur [illegible] bone destruction [illegible] tumor [illegible] bone [illegible]

Fig 61 (right).—Tumor cells [illegible] many fat globules [illegible] some monster forms [illegible] Hematoxylin-eosin; reduced from ×175. (Courtesy of Dawson, E. K.: J Bone & Joint Surg 35-B:513, October 1953.)

bone. The whole lower thigh was diffusely tender; movement of the knee was limited only by pain. There were no enlarged lymph nodes or evidence of tumor elsewhere. The provisional clinical diagnosis from the x-rays (Fig 60) was osteogenic sarcoma or Ewing's tumor. Rapidly prepared biopsy sections showed a cellular liposarcoma with both mature and poorly differentiated tumor cells including some monstrous forms (Fig 61). This diagnosis was supported by a generalized positive scarlet red reaction in a non necrotic area. The leg was disarticulated at the hip joint. The patient died nine months later.

Tumor tissue from the amputated limb confirmed the initial biopsy diagnosis. It showed in many areas the character

J Bone & Joint Surg 35-B:513, October 1953.

The author believes that the solitary plasmocytoma of bone is a rare clinical variant of multiple myeloma. In no instance is it possible to give an accurate prognosis Neither radiotherapy nor surgery seems to prevent ultimate devel opment of widespread lesions

The lesions may become very large before they are dis



Fig 59—Coarsely trabeculated multicystic myeloma of left upper femur with pathologic fracture Fracture now united following radiotherapy (Courtesy of Yeatts, I J Fac Radiologists 8 132 144 October 1956)

covered They occur mostly in the upper femur, ilium and vertebrae They are purely osteolytic arising in the medulla and involving the cortex by outward spread. Pathologic fracture is common When further bone lesions eventually occur they are usually identical with those characteristic of multiple myeloma viz small rounded punched-out defects but large areas of medullary and cortical destruction may develop Two radiologic varieties occur viz the trabec ulated type (Fig 59) resembling an osteoclastoma, and the

nontrabeculated type simulating an osteolytic secondary

Liposarcoma of Bone is reported by Edith K. Dawson[3] (Edinburgh)

Woman, 28, complained of pain and swelling of the left lower thigh after mild trauma to the knee five weeks previously On examination, there was broadening of the lower end of the *left thigh*, with added fulness on the anteromedial aspect. Palpation revealed enlargement of the lower half of the femur with several hard, rounded masses outside and apparently directly connected with the

Fig [illegible] left [illegible] shows bone destruction [illegible] tumor [illegible]
Fig [illegible] Tumor cells with [illegible] some [illegible] reduced from ×1 [illegible] (Courtesy of Dr. Edith K. Dawson [illegible] J Path & Bact [illegible] 513 [illegible] October 1953)

bone The whole lower thigh was *diffusely tender* movement of the knee was limited only by pain No other abnormality was noted There were no enlarged lymph nodes or evidence of tumor elsewhere The provisional clinical diagnosis from the x-rays (Fig (B)) was osteogenic sarcoma or Ewing's tumor Rapidly prepared biopsy section showed a cellular liposarcoma with both mature and poorly differentiated tumor cells including some signet ring forms (Fig (C)) The diagnosis was supported by a generalized positive scarlet red reaction in a non-necrotic area The leg was disarticulated at the hip joint The patient died nine months later

Tumor tissue from the amputated limb confirmed the initial biopsy diagnosis It showed in many areas the character

[3] J Path & Bact [illegible] (Oct 1953)

The author believes that the solitary plasmocytoma of bone is a rare clinical variant of multiple myeloma. In no instance is it possible to give an accurate prognosis Neither radiotherapy nor surgery seems to prevent ultimate development of widespread lesions

The lesions may become very large before they are dis



Fig 59—Coarsely trabeculated multicystic myeloma of left upper femur with pathologic fracture Fracture now united following radiotherapy (Courtesy of Yentis, E: J Fac. Radiologists 8 132 144 October 1956.)

covered They occur mostly in the upper femur ilium and vertebrae They are purely osteolytic arising in the medulla and involving the cortex by outward spread Pathologic fracture is common When further bone lesions eventually occur they are usually identical with those characteristic of multiple myeloma viz small rounded punched-out defects but large areas of medullary and cortical destruction may develop Two radiologic varieties occur viz the trabeculated type (Fig 59) resembling an osteoclastoma and the

nontrabeculated type simulating an osteolytic secondary

Liposarcoma of Bone is reported by Edith K. Dawson[3] (Edinburgh)

Woman 28, complained of pain and swelling of the left lower thigh after mild trauma to the knee five weeks previously On examination there was broadening of the lower end of the left thigh with added fulness on the anteromedial aspect. Palpation revealed enlargement of the lower half of the femur with several hard rounded masses outside and apparently directly connected with the



Fig [illegible] (left) X-ray of femur showing bone destruct[illegible] tumor [illegible] outside bone not seen

Fig 61 (right) Tumor cells [illegible] giant [illegible] monster forms [illegible] (Courtesy [illegible] Dawson E K J Path & Bact [illegible] October 1953)

bone The whole lower thigh was diffusely tender movement of the knee was limited only by pain No other abnormality was noted. There were no enlarged lymph nodes or evidence of tumor elsewhere The provisional clinical diagnosis from the x rays (Fig 60) was osteogenic sarcoma or Ewing's tumor Rapidly prepared biopsy section showed a cellular liposarcoma with both mature and poorly differentiated tumor cells including some monstrous forms (Fig 61) The diagnosis was supported by a generalized positive scarlet red reaction in a non necrotic area. The leg was disarticulated at the hip joint The patient died 8 months later

Tumor tissue from the amputated limb confirmed the initial biopsy diagnosis It showed in many areas the character-

nontrabeculated type simulating an osteolytic secondary

Liposarcoma of Bone is reported by Edith K. Dawson[3] (Edinburgh)

Woman, 28, complained of pain and swelling of the left lower thigh after mild trauma to the knee five weeks previously On examination there was broadening of the lower end of the left thigh, with added fulness on the anteromedial aspect. Palpation revealed enlargement of the lower half of the femur with several hard, rounded masses outside and apparently directly connected with the

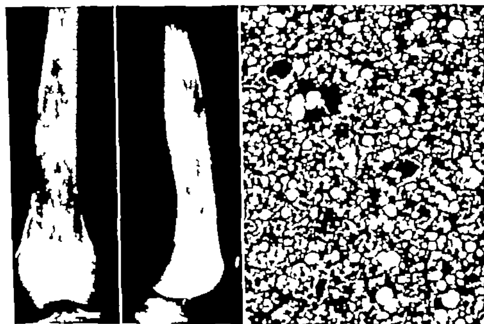


Fig 60 (left) —X-ray of femur showing bone destruction; tumor tissue outside bone not shown.

Fig 61 (right) —Tumor cells with one or many fat globules, some monster forms and occasional mitoses. Hematoxylin-eosin; reduced from X 120

(Courtesy of Dawson, E. K. J Path. & Bact. 70:513-520 October 1955)

bone. The whole lower thigh was diffusely tender movement of the knee was limited only by pain No other abnormality was noted. There were no enlarged lymph nodes or evidence of tumor elsewhere. The provisional clinical diagnosis from the x rays (Fig 60) was osteogenic sarcoma or Ewing's tumor Rapidly prepared biopsy sections showed a cellular liposarcoma with both mature and poorly differentiated tumor cells including some monstrous forms (Fig 61) This diagnosis was supported by a generalized positive scarlet red reaction in a non-necrotic area. The leg was disarticulated at the hip joint. The patient died nine months later

Tumor tissue from the amputated limb confirmed the initial biopsy diagnosis It showed in many areas the character-

(3) J Path. & Bact. 70:513-520 October 1955

The author believes that the solitary plasmocytoma of bone is a rare clinical variant of multiple myeloma. In no instance is it possible to give an accurate prognosis Neither radiotherapy nor surgery seems to prevent ultimate development of widespread lesions

The lesions may become very large before they are dis



Fig 59 —Coarsely trabeculated multicystic myeloma of left upper femur with pathologic fracture. Fracture now united following radiotherapy (Courtesy of Yentis, L. J Fac Radiologists 8 132 144 October 1956.)

covered. They occur mostly in the upper femur ilium and vertebrae They are purely osteolytic arising in the medulla and involving the cortex by outward spread Pathologic fracture is common When further bone lesions eventually occur they are usually identical with those characteristic of multiple myeloma viz small rounded punched-out defects but large areas of medullary and cortical destruction may develop Two radiologic varieties occur viz., the trabeculated type (Fig 59) resembling an osteoclastoma and the

nontrabeculated type simulating an osteolytic secondary

Liposarcoma of Bone is reported by Edith K Dawson[3] (Edinburgh)

Woman, 28 complained of pain and swelling of the left lower thigh after mild trauma to the knee five weeks previously On examination there was broadening of the lower end of the left thigh, with added fulness on the anteromedial aspect. Palpation revealed enlargement of the lower half of the femur with several hard, rounded masses outside and apparently directly connected with the

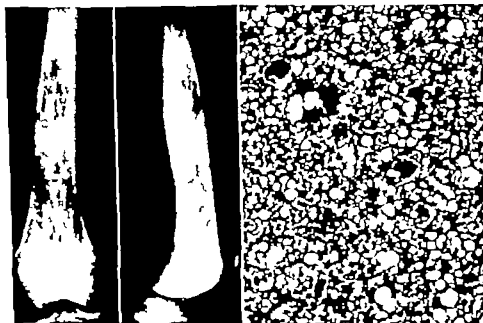


Fig 60 (left) —X-rays of femur showing bone destruction tumor tissue outside bone not shown.
Fig 61 (Right) —Tumor cells with one or many fat globules, some monster forms and occasional mitoses. Hematoxylin-eosin; reduced from X 120
(Courtesy of Dawson, E. K. J Path. & Bact. 70 513-520 October 1955)

bone The whole lower thigh was diffusely tender movement of the knee was limited only by pain. No other abnormality was noted. There were no enlarged lymph nodes or evidence of tumor elsewhere. The provisional clinical diagnosis from the x rays (Fig 60) was osteogenic sarcoma or Ewing's tumor *Rapidly prepared biopsy* sections showed a cellular liposarcoma with both mature and poorly differentiated tumor cells, including some monstrous forms (Fig 61) This diagnosis was supported by a generalized positive scarlet red reaction in a non necrotic area. The leg was disarticulated at the hip joint. The patient died nine months later

Tumor tissue from the amputated limb confirmed the initial biopsy diagnosis It showed in many areas the character-

(3) J Path. & Bact. 70 513-520 October 1955

The nuclei of these cells were usually eccentrically placed and were fairly basophilic. Many of the nuclei were vesicular and contained one or two nucleoli. Only a few mitotic figures were present (Fig 62).

With an alveolar soft part sarcoma the course may be long and protracted even when metastatic lesions are present.

The origin of the tumor is not known. Its organoid appearance is similar to that of paraganglion tissue and of the

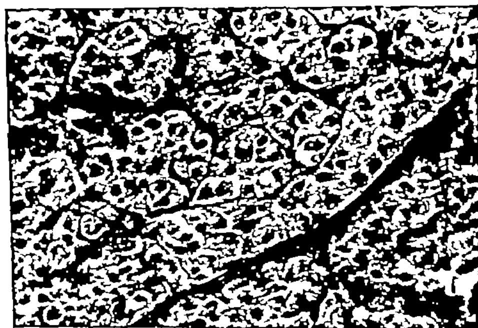


Fig. 62.—Characteristic pseudoalveolar pattern of cells; reduced from ×500. (Courtesy of Stein, A. H., Jr.: J Bone & Joint Surg 38-A 1126-1130, October 1956.)

carotid and aortic bodies. Johnson has suggested that it originates from paraganglion tissue in the region of the adductor canal.

Postradiation Sarcoma of Bone was studied in 17 patients by Alvina O Sabanas, David C Dahlin, Donald S Childs and John C Ivins[5] (Mayo Clinic and Found.). All had been subjected to x ray or radium therapy. About 50 such cases have already been reported in the literature. A *latent period*, namely an interval of good health and absence of clinical symptoms of disease between the time of radiotherapy and appearance of the malignant lesion, was present in all

(5) Cancer 9: 2 54-, May June 1956

istic lobulation of liposarcoma with much capillary vascularity There was considerable variety of tumor structure, sometimes with sudden transitions from one tissue type to another but all the areas examined from inside the bone showed a fairly well differentiated malignant fatty tissue. Some areas had the appearance of almost normal fat but with scattered cells with large nuclei and very occasional mitotic figures other parts were composed of rounded cells with small fat globules of the hibernoma type and no mature fat cells Some areas might have suggested metastatic hypernephromatoid renal carcinoma but this impression was dispelled by appearances in adjacent areas just outside the cortex where the tumor consisted predominantly of plump spindle cells in a fasciculated pattern though still showing numerous fat globules in the cytoplasm As the tumor approached the skin, it became an undifferentiated spindle cell growth with evidence of more rapid proliferation and little if any indication of its liposarcomatous nature.

► [This is an exceedingly rare malignant bone tumor Study of the microscopic sections showed five quite different pictures. This emphasizes the importance of obtaining a large amount of tissue when carrying out a biopsy on any malignant or supposedly malignant tumor A small punch biopsy or tissue obtained in minute quantities with a curet or from the periphery of the tumor would have led to a faulty diagnosis in this instance as in countless others.—Ed.]

Alveolar Soft Part Sarcoma is reported by Arthur H Stein Jr[4] (Washington Univ) The neoplasm has also been described as a nonchromaffin paraganglioma and a malignant granular cell myoblastoma

Woman 21 was hospitalized. For a year she had noticed a mass in the posterior aspect of the left thigh. The only other symptom was dull aching pain when she was seated. She had no history of trauma. Examination revealed a firm mass, 6 × 4 in., neither tender nor hot, at the apex of the left popliteal space, adherent to the deep structures but not to the skin, with no vascular or nerve changes distal to it. No enlarged inguinal nodes were observed. Pulmonary metastases were present. A high thigh amputation was done.

Sections of the neoplasm revealed a very uniform appearance. It was composed of groups of cells characteristically pseudoalveolar or organoid in arrangement. The cytoplasmic outline of each cell was distinct, and the cells were moderate sized and oval or polyhedral shaped. The cytoplasm was only faintly eosinophilic and was finely granular Fat stains revealed only a slight amount of cytoplasmic fat.

(4) J Bone & Joint Surg. 38-A 1126-1130 October 1956.

The nuclei of these cells were usually eccentrically placed and were fairly basophilic. Many of the nuclei were vesicular and contained one or two nucleoli. Only a few mitotic figures were present (Fig 62)

With an alveolar soft part sarcoma the course may be long and protracted even when metastatic lesions are present.

The origin of the tumor is not known Its organoid appearance is similar to that of paraganglion tissue and of the

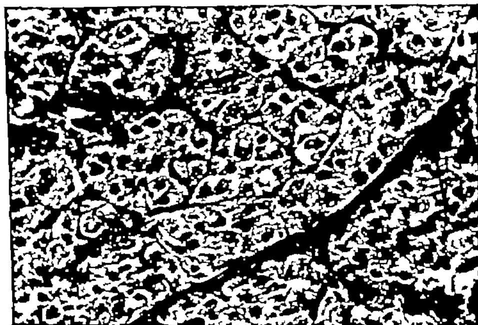


Fig 62.—Characteristic pseudoalveolar pattern of cells; reduced from ×500 (Courtesy of Stein, A. H., J J Bone & Joint Surg 38-A 1126-1130 October 1956.)

carotid and aortic bodies Johnson has suggested that it originates from paraganglion tissue in the region of the adductor canal

Postradiation Sarcoma of Bone was studied in 17 patients by Alvina O Sabanas David C Dahlin Donald S Childs and John C Ivins[5] (Mayo Clinic and Found) All had been subjected to x ray or radium therapy About 50 such cases have already been reported in the literature. A latent period namely an interval of good health and absence of clinical symptoms of disease between the time of *radiotherapy* and appearance of the malignant lesion was present in all

(5) Cancer 9 2 342, May June 1956

cases in the present series its average length was more than 10 years

Three of the sarcomas arose in normal bone within the field of irradiation after radiotherapy of adjacent lesions The remaining 14 occurred at the site of pre-existing benign lesions of bone

The ultimate malignant tumor was manifested by an abrupt onset and a rapidly developing course quite unlike those of the initially indolent process The longest duration of clinical symptoms of malignant change before the sarcoma was proved microscopically was 10 months and the average was 18 weeks

Excessive doses of radiation appeared to be the most significant factor in production of sarcoma, although individual variations in radiosensitivity obviously exist Sarcomas of bone may follow single or multiple exposures to ionizing radiation

While it is true that postradiation sarcomas develop in only a small percentage of treated patients the number of known instances of such a complication is sufficient to dictate extreme caution Giant cell tumors of bone appear to be particularly prone to malignant transformation Certainly one never should employ radiation as conservative therapy for lesions that do not require it

Late Effects (25-40 Years) of Early Medical and Industrial Use of Radioactive Materials I Their Relation to More Accurate Establishment of Maximal Permissible Amounts of Radioactive Elements in the Body was studied by W B Looney[6] (U S Naval Hosp Bethesda Md) Radium is considered to be dispersed throughout the soft tissues and skeleton when it first is taken into the body Most of the radium is eliminated during the first week in the feces and within months *90-99 9%* is eliminated

The most practical and reliable method of determining the amount of radium remaining in the body is external counting and collection of expired air from the patient. The first daughter product of radium is radon 50-70% of which is eliminated in the expired air the rest being trapped in the skeleton or body tissues The fraction of the radon trapped in the body is estimated by determining the gamma ray ac

(6) J Bone & Joint Surg. 37 A 1169-1187 December 1955

tivity given off by decay of the daughter products of radon The manner of radium deposition was studied by sectioning entire bones serially and placing them on x ray films The precise manner of the deposition of radium was obtained by detailed autoradiography

Radium was found in small areas of high focal concentration irregularly distributed in compact and cancellous bone In compact bone only a small percentage of the haversian systems and interstitial lamellae showed appreciable concentrations In some instances radium was concentrated in one or two concentric lamellae in others it was deposited around the central canal or periphery of the haversian system The areas of radium concentration in trabecular bone were usually 5 15μ in greatest dimension but range in size and shape of the areas was wide and they were found at any depth within the trabecula In some sections exposed for a long time distribution of radium was much less concentrated and much more uniform These findings are in agreement with existing theories that radium has more than one principal mode of deposition

An approximation of the total radium may be obtained by radiochemical analysis of bone specimens Detailed autoradiography is more accurate for determining size of the small concentrations of radium in the skeleton Quantitative autoradiography is more accurate for determining magnitude of the concentrations External physical measurements give a much more reliable estimate of total body radium

Histologic specimens from three luminous-dial workers and six patients who had received radium were studied The radioactive elements were present in the skeleton 12 35 years before biopsy and autopsy Two workers and two patients had bone tumors Atypical osseous tissue was present in cancellous bone usually near the articular surface of such bones as the humerus and femur and in the metaphysial area It was adjacent to the trabeculae in some areas In some areas hyperplasia of the trabeculae was noted while in others destruction of the trabeculae was present. The trabecular spaces were usually filled with an acellular fibrous tissue In general there was absence of radioactivity in atypical osseous and acellular fibrous tissues In most instances there was prominent absence of osteocytes in the

lacunae and little conclusive evidence of bone regeneration.

In compact bone the central canals varied in size from normal to nearly complete destruction of the entire haversian system Many central canals were occluded with a dark staining material similar to the atypical osseous tissue in the trabecular spaces Cells were usually absent in the lacunae. Minimal evidence of bone regeneration was observed, and areas of destruction usually were replaced with fibrous connective tissue.

The study *suggests that radium deposited in the skeleton* usually initiates a sequence of events which eventually produces pathologic changes These changes are probably the end result of many intermediate factors such as trauma, damage to blood supply hormonal imbalance decreased bone repair and increased bone destruction from other causes Histologic sections indicate that haversian systems may undergo periods of bone formation

Tumors of the Hand are discussed by Joseph L. Posch[7] (Detroit) One of the commonest tumors that arise from the skin is the wart Frequently this tumor disappears spontaneously but occasionally it has to be removed by surgery In such cases the entire growth should be excised and the skin closed with sutures Both premalignant and malignant tumors arise on the hand Premalignant tumors occur when the skin has been irritated by such factors as x rays the rays of the sun and chemicals Malignant tumors may arise as the result of chronic infections burn scars or arsenicals Only 5-10% of cutaneous carcinomas occur in the hand and foot Among these the squamous cell carcinoma, usually located on the dorsum of the hand is the more common (Fig 63) If it is allowed to grow it eventually involves the tendons bones and muscles hemorrhage may occur if large vessels are eroded Benign moles are *found* on the hand as well as on other parts of the body If they are subject to irritation or appear to be enlarging they should be removed. The commonest location of malignant melanoma is on the thumb

Fibromas occur on the hand but only rarely Two types of this tumor have been noted—a deep type which arises from the joint capsules and a superficial type Lipomas of

(7) J Bone & Joint Surg 38-A 517 540 June, 1956.

the hand resemble those occurring elsewhere on the body Grossly they are soft well encapsulated tumors The symptoms produced are due to mechanical disturbances

Ganglions are the commonest tumors of the hand Some authors feel that they are synovial tumors which have arisen from the synovial membrane and from the fibrous tissues that enter into the formation of tendon sheaths and joint capsules In some instances they disappear spontaneously Occasionally the exploration of a diffuse tumor on the dorsal aspect of the wrist reveals a cystlike mass that completely surrounds all the tendons Preoperatively this mass is usu

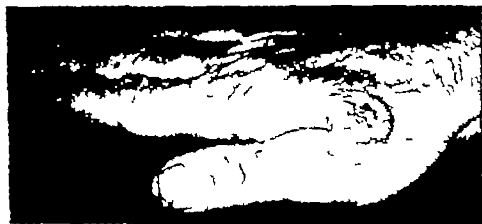


Fig. 63 —Squamous cell carcinoma of hand Involved tissues were excised and skin graft applied to defect. There has been no recurrence in five years. (Courtesy of Posch J L J Bone & Joint Surg 38-A:517 540 June, 1956.)

ally diagnosed as a ganglion but the later diagnosis of the pathologist is usually chronic tenosynovitis or chronic villonodular tenosynovitis

Giant cell tumor is one of the commoner tumors of the hand Its treatment consists in excision The neoplasm is benign and if it is entirely removed will not recur The rate of recurrence is said to be 10% (Fig 64)

Glomus tumors may be found in almost any part of the body but particularly on the fingers especially the sub ungual areas The tumor is made up of blood vessels with thickened walls the media in these vessels having been replaced by epithelial cells interspersed with smooth muscle cell and myelinated and nonmyelinated nerve fibers Treatment consists in surgical removal and prognosis is good (Fig 65)



Fig. 64.—Giant cell tumor on little finger. After excision, with preservation of flexor tendon, there was good return of function. There has been no recurrence in 3½ years. (Courtesy of Posch, J. L.: J. Bone & Joint Surg. 38-A:517-540, June, 1956.)



Fig. 65.—Glomus tumor on palm of physician, aged 70, who had had symptoms for years, chiefly pain and soreness. Removal of tumor resulted in relief of pain. (Courtesy of Posch, J. L.: J. Bone & Joint Surg. 38-A:517-540, June, 1956.)

Epidermoid or inclusion cysts frequently found on the hand especially on the volar aspect of the fingers and palm usually occur in men who do a good deal of manual labor Aneurysms due to trauma usually arise from the superficial volar arch but may also arise from the deep volar arch They may result from an injury to the artery which has been caused by a blunt blow or a sharp instrument. Arteriovenous aneurysms are usually congenital in origin and may be noted in the newborn as well as in older patients In young per-



Fig 66.—Fibrosarcoma in left index finger After amputation, there has been no metastasis in five years. (Courtesy of Posch, J L J Bone & Joint Surg. 38-A 517 540 June, 1956.)

sons an increase in the growth of the involved finger may occur

The benign bone tumors encountered on the hand are cysts chondromas exostoses xanthomas giant cell tumors osteochondromas and osteoid-osteomas The malignant tumors that are encountered are osteogenic sarcomas chondrosarcomas and Ewing s tumors Metastatic tumors are extremely rare Fibrosarcomas are thought to arise from connective tissue elements or from benign tumors of fibrous tissue origin Their appearance may vary considerably as has been shown by microscopic studies and it sometimes happens that the clinical course is that of a benign tumor

while the microscopic picture is that of a malignant tumor For high grade malignant tumors the prognosis is poor (Fig 66)

Osteogenic Sarcoma of Phalanx after Chronic Roentgen Ray Irradiation is reported by Robert E. Carroll John T Godwin and William L Watson[8] (Memorial Center for Cancer New York)

Man 55 had cutaneous lesion of terminal phalanx of right thumb excised pathologic diagnosis was keratosis In the early years of

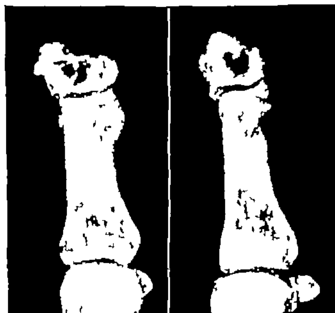


Fig. 67 —Anteroposterior and oblique views of terminal phalanx showing tumor (Courtesy of Carroll, R. E., *et al* Cancer 9 753 755 July Aug., 1956.)

dental practice he had performed a large series of x rays holding the film in place with the right thumb and this habit had persisted. At 50 the thumb was injured by a door but x rays revealed no fracture. At 53 swelling and cellulitis developed in the thumb and were treated by x rays Later the lesion was excised. Because of small excrescences around the site of the operative procedure, additional x ray treatment was given, but the terminal phalanx became more swollen tender and inflamed.

Five years after excision of the keratosic lesion, he had swelling of the terminal phalanx X rays revealed proliferative changes of varying densities in the terminal phalanx (Fig 67) and the distal phalanx and distal half of the proximal phalanx were amputated. The pathology was osteogenic sarcoma. Microscopically the skin

(8) Cancer 9 7 3 755 July Aug 1956.

showed pronounced hyperkeratosis, with subcutaneous scarring and atrophy of sweat glands. The tumor was composed of neoplastic osteoid and bone (Fig 68) with anaplastic areas

History of prolonged intermittent exposure to x-ray radiation clinical manifestation of recurring hyperkeratosis atrophic sweat glands and development of an osteogenic

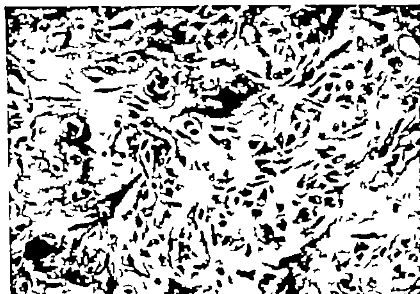


Fig. 68—Section of osteogenic sarcoma showing osteoid and bone formation. Hematoxylin-eosin reduced from ×140 (Courtesy of Carroll, R. E., *et al.* Cancer 9 753-755 July Aug., 1956)

sarcoma in an unusual location make the diagnosis of post-radiation osteogenic sarcoma probable

Major Exarticulations for Malignant Neoplasms of Extremities Interscapulothoracic Amputation Hip Joint Disarticulation and Interilioabdominal Amputation Report of End Results in 228 Cases Interscapulothoracic amputation hip joint disarticulation and interilioabdominal amputation (hemipelvectomy) are done most commonly for soft part sarcomas malignant tumors of the skin and bone sarcomas George T Pack[9] (Memorial Center for Cancer New York) reports on 228 patients aged 13 months to 79 years who underwent one of these major amputations

Dissection of palpable and even of suspected lymph nodes conjoined with amputation is more commonly necessary in patients with the following cancers (a) metastatic mela-

(9) J Bone & Joint Surg 38-A 49-762, April, 1956.

noma of the extremities (b) metastatic epidermoid carci noma of the extremities (c) malignant synovioma (d) fibrosarcoma and rhabdomyosarcoma and (e) reticulum cell sarcoma

Since many of the amputations were done with the sole intent of palliation their value cannot be measured by their rate of cure alone Of 81 patients who had interscapulothoracic amputation 28 were living at the time of the study 13 of them without cancer for more than five years Hip joint disarticulation performed on 94 patients resulted in a five year cure in 8 while hemipelvectomy performed on 46 patients lead to a five year cure in 3 There were no operative deaths

Main reasons for failure were location of the primary cancer outside the amputated extremity borderline operability surgery performed on recurrent cancer recurrence in the stump and distant metastases

Osseous Metastases of Cancer of Prostate Osteoplastic Form According to J A Lièvre[1] diagnosis of osseous metastases from cancer of the prostate when made erroneously as it often is is a serious error because it carries a fatal prognosis prevents performance of necessary operations and leads to ill advised estrogen treatment Such a diagnosis should be rigorously made and must never be based on presumption Osseous metastases of prostatic origin are common because prostatic cancer is common but it is wrong to suppose that the prostate is the most usual source of bone cancer in men or that bone cancer of prostatic origin can assume the most diverse aspects Is usually appears in an osteoplastic form the mixed form—osteoplastic and lytic—being rare and the pure lytic form exceptional

The condition with which prostatic bone cancer is most often confused is localized or disseminated Paget s bone disease The distinction must be based on urologic general clinical and radiologic signs and on comparative study of the acid and alkaline phosphatase levels This study is essential because radiologic signs alone are not enough to establish diagnosis of cancer Even less adequate for diagnosis are local signs of prostatic cancer because Paget s disease

(1) Presse méd. 64:1-4 Feb. 29 1956.

which is quite common and often latent may be a coincidental finding on urologic examination

A positive diagnosis of prostatic cancer may be made when all the following signs are present (1) clinical radiologic and developmental indications (2) local signs of prostatic cancer (3) very high acid phosphatase levels with normal or only slightly elevated alkaline phosphatase levels and (4) evident response of the functional symptoms to estrogen therapy Biopsy of the bone a specimen of which can be easily taken from the iliac crest, often proves helpful The effect of estrogen therapy provides confirmatory evidence but use of estrogens as a diagnostic test is not advisable

The lesions appear first in the pelvis then in the spine (in exceptional cases the spine may be affected first) ribs and skull and last in the rest of the skeleton The essential elementary radiologic sign discernible in young lesions by means of enlarged radiographs is a nodular opacity caused by a spheroid formation around a cancer colony It is superposed on the trabeculum of the rest of the bone but has no architecture of its own that can be detected later it effaces the trabeculum That this new formation may extend beyond the normal silhouette of the bone explains the general osseous hypertrophy of the advanced stages which is quite different from that of Paget s disease As the osseous foci increase the pictures they present become diversified appearing as well defined opaque foci regional opacities opacities limited to one bone, disseminated opacities or complete skeletal opacity

Differential diagnosis includes various other conditions besides Paget s disease there is virtually no radiologic sign that is characteristic of prostatic bone cancer It should be kept in mind that a dark vertebra (ivory vertebra opaque vertebra) is much oftener noncancerous than cancerous

noma of the extremities (b) metastatic epidermoid carcinoma of the extremities (c) malignant synovioma, (d) fibrosarcoma and rhabdomyosarcoma and (e) reticulum cell sarcoma.

Since many of the amputations were done with the sole intent of palliation their value cannot be measured by their rate of cure alone Of 81 patients who had interscapulothoracic amputation, 28 were living at the time of the study, 13 of them without cancer for more than five years. Hip joint disarticulation performed on 94 patients resulted in a five year cure in 8 while hemipelvectomy performed on 46 patients lead to a five year cure in 3 There were no operative deaths

Main reasons for failure were location of the primary cancer outside the amputated extremity borderline operability surgery performed on recurrent cancer recurrence in the stump and distant metastases

Osseous Metastases of Cancer of Prostate Osteoplastic Form. According to J A Lièvre [1] diagnosis of osseous metastases from cancer of the prostate when made erroneously as it often is is a serious error because it carries a fatal prognosis prevents performance of necessary operations and leads to ill advised estrogen treatment Such a diagnosis should be rigorously made and must never be based on presumption Osseous metastases of prostatic origin are common because prostatic cancer is common but it is wrong to suppose that the prostate is the most usual source of bone cancer in men or that bone cancer of prostatic origin can assume the most diverse aspects Is usually appears in an osteoplastic form the mixed form—osteoplastic and lytic—being rare and the pure lytic form exceptional.

The condition with which prostatic bone cancer is most often confused is localized or disseminated Paget s bone disease The distinction must be based on urologic, general clinical and radiologic signs and on comparative study of the acid and alkaline phosphatase levels This study is essential because radiologic signs alone are not enough to establish diagnosis of cancer Even less adequate for diagnosis are local signs of prostatic cancer because Paget s disease

(1) Presse med 44 1 4 Feb 29 1936.

which is quite common and often latent may be a coincidental finding on urologic examination.

A positive diagnosis of prostatic cancer may be made when all the following signs are present (1) clinical radiologic and developmental indications (2) local signs of prostatic cancer (3) very high acid phosphatase levels with normal or only slightly elevated alkaline phosphatase levels and (4) evident response of the functional symptoms to estrogen therapy Biopsy of the bone a specimen of which can be easily taken from the iliac crest, often proves helpful The effect of estrogen therapy provides confirmatory evidence but use of estrogens as a diagnostic test is not advisable

The lesions appear first in the pelvis then in the spine (in exceptional cases the spine may be affected first) ribs and skull and last in the rest of the skeleton The essential elementary radiologic sign discernible in young lesions by means of enlarged radiographs is a nodular opacity caused by a spheroid formation around a cancer colony It is superposed on the trabeculum of the rest of the bone but has no architecture of its own that can be detected later it effaces the trabeculum That this new formation may extend beyond the normal silhouette of the bone explains the general osseous hypertrophy of the advanced stages which is quite different from that of Paget s disease. As the osseous foci increase the pictures they present become diversified appearing as well defined opaque foci regional opacities opacities limited to one bone disseminated opacities or complete skeletal opacity

Differential diagnosis includes various other conditions besides Paget s disease there is virtually no radiologic sign that is characteristic of prostatic bone cancer It should be kept in mind that a dark vertebra (ivory vertebra opaque vertebra) is much oftener noncancerous than cancerous

Natural History of Rheumatoid Spondylitis is discussed by Baruch Blumberg and Charles Ragan[2] (Columbia Univ.) Rheumatoid spondylitis (ankylosing spondylitis, Marie-Strümpell disease and Bechterew's disease) afflicts young men primarily. It is characterized by back pain and deformity resulting from involvement of the sacroiliac and small joints of the spine, paravertebral calcification and, in advanced disease bony ankylosis of these regions. The hips, knees, shoulders and occasionally other peripheral joints may also be involved. It is a chronic malady with its onset in the prime of life and its stigma remaining until death. Its cause is unknown. According to some investigators, the diarthrodial joints of the spine and pelvis, the costovertebral joints, the costotransverse joints and in some instances, the symphysis pubis, the sternoclavicular, manubriosternal and other peripheral joints are involved in an inflammatory process similar to that seen in peripheral rheumatoid arthritis. However Van Swaay holds that the process in the sacroiliac joints is a proliferation of new cartilage replacing the old without evidence of inflammation. The joint space is destroyed by this new growth and subsequently ossified.

Of 142 patients (80% men) examined in the present study only 5 were confined to the bed or chair, whereas 76% were working regularly, supporting self and family. The functional status in the average patient was well maintained during most of his life. Pain was greatest during the early phase of the disease; in most patients it decreased in the latter years. X ray changes and physical deformity appeared to progress relentlessly in most patients. While 67% of the patients examined had peripheral joint pain and stiffness in the past which often was accompanied by objective but transient swelling, tenderness and heat, only 30% had actual objective evidence of peripheral joint deformity at the time seen. When objective involvement did occur, the joints involved usually differed from the joints affected in classical

(2) Medicine 35:1-31, February 1956.

peripheral joint rheumatoid arthritis One or more attacks of iritis occurred in 25% of patients during the course of the disease

With the possible exception of the erythrocyte sedimentation rate no laboratory tests of practical value are currently in use for the diagnosis of rheumatoid spondylitis The sedimentation rate was normal in 20% of patients

"Systemic illness is not so common in this disease as it is in peripheral rheumatoid arthritis and the relationship of valvular heart disease to rheumatoid spondylitis remains obscure Aside from pain and stiffness the patients do not feel particularly debilitated as evidenced by their excellent occupational history Although exacerbations may occur late in the disease particularly in patients with peripheral joint involvement the period of acute illness is usually restricted to the early years Acute attacks of iritis on the other hand may occur at any time but bear little relationship to the arthritic complaints

The insulting agent whatever it may be does not appear to have a sustained effect whereas the ankylosis of the joints presumably a reaction to the original insult may take years to achieve completion

Biochemistry of Rheumatoid Arthritis was reviewed by J I Routh[3] (State Univ of Iowa) Plasma viscosity values and erythrocyte sedimentation rates have long been used as a rough index of the activity of the disease in rheumatoid arthritis Whereas they are of value clinically biochemically they are dependent on changes in the plasma protein values which are more accurately measured by other methods

Electrophoretic analysis of plasma and serum proteins appears to be a valuable tool in arthritic research By serial determinations the various stages of the disease can be followed and recognized with some certainty Clinical remission of arthritis whether spontaneous or therapeutically induced invariably produces improvement in electrophoretic pattern with a definite shift toward normal

Better understanding of the components of synovial fluid and their changes in the disease may provide some of the

It seems that studies on the permeability of the synovial membrane should furnish the proper answer to many perplexing questions in arthritis Unfortunately the technics are so complex and diversified that results of these studies only lead to confusion Whether the synovial membrane has exactly the same properties as all other connective tissue or whether it is a specialized membrane that can be used to screen antiarthritis drugs remains to be seen

Despite the metabolic studies dealing with changes in carbohydrate metabolism there is as yet no clearcut evidence of the relation of this metabolism to the progress of rheumatoid arthritis On the other hand protein metabolism is clearly related to the disease Nitrogen balance studies free amino acids in the plasma and their increased excretion in the urine and the changes in the electrophoretic components of plasma and serum all point to definite changes protein metabolism in arthritis

Pleural Effusion Complicating Rheumatoid Arthritis was observed by Peter A Emerson[4] (St George's Hosp London) in five men and one woman aged 45-54 In each the effusion developed in the course of polyarthritis of the rheumatoid type A number of different diagnoses were made because pleurisy with effusion was not at first recognized as a manifestation of rheumatoid disease All six patients have been followed for 2-4½ years after onset of the effusions None have shown any clinical or radiologic evidence of a lesion in the lung parenchyma to account for the effusion The presence of effusion was confirmed in every instance by diagnostic aspiration of clear or cloudy sterile straw-colored fluid Tubercle bacilli did not grow on culture. All sputum examined was also negative for tubercle bacilli

The pleurisy was associated with an exacerbation of rheumatoid arthritis There was no evidence that the subsequent course of arthritis was altered by appearance of the effusions Treatment appears to be that for the arthritis Corticotropin was given to two patients in each joint symptoms improved but pleural effusions were unaffected The fluid cleared completely in one The effusions may be unusually

(4) Brit. M J 1 428-429 Feb. 25 1956.

persistent. In two patients large effusions were still present more than two years after their first appearance

Rheumatoid Arthritis in a Population Sample is evaluated by clinical and laboratory criteria in a study by J H Kellgren and J S Lawrence[5] (Univ of Manchester) who consider that a meticulous study of a small and well sampled population is of greater epidemiologic value than more widespread sampling with less rigorous criteria and less complete evaluation The total number of persons studied was 467 a 1 10 sample of an English town The study plan included a complete evaluation of each person including an interview with careful history taking complete physical examination x ray examination of multiple joints and a differential sheep cell agglutination test (D.A T) Several persons declined the blood test and/or the x ray examinations however and only 350 people were completely evaluated X rays were made of 380 persons (207 women) and these form the general basis for the statistical evaluation The survey was limited to the 55-64 year old age group X ray films were made of hands feet knees pelvis and lumbar and cervical spine

Clinical rheumatoid arthritis was considered to be definitely present in 3% of the men and 15% of the women By contrast radiologic evidence of rheumatoid arthritis was present in approximately equal incidence in men and women (8% and 10% respectively) and the D A T likewise showed no sex differences with 5% of the men and 6% of the women having positive reactions Osteoporosis of the hands was found only in women however for some uncertain reason Thirteen men and seven women with positive x ray and/or D.A T findings had no clinical evidence of rheumatoid arthritis Of the patients with severe clinical rheumatoid arthritis 90% had positive x rays and/or D.A T However inclusion of the large group with slight or doubtful clinical rheumatoid arthritis and of those with a past history of polyarthritis considerably alters the statistics In this group there is a much lower incidence of positive x ray or D A T For practical reasons therefore there appears to be a useful clinical dividing line at "typical rheu

(5) Ann Rheumat D 15 1 11 March 1956

matoid arthritis of moderate or great severity involving the hands and feet.'

The prevalence of rheumatoid arthritis ranges from 1% for men and 3% for women with evidences of severe clinical rheumatoid arthritis confirmed by x rays and agglutination test, to 11% for men and 27% for women with all grades of clinical disease including a past history of polyarthritis irrespective of laboratory findings Therefore, precise diagnostic definition is essential for a study of comparative incidence of this disease in various populations

Rheumatoid Arthritis and What Can Be Done about It. John W Sigler and Dwight C Ensign[6] belie e that early diagnosis of the disease and prompt treatment will speed remission and minimize deformities Physical findings in moderate and advanced cases show progression of muscle atrophy and limitation or even loss of joint motion Rheumatoid nodules appear in 15-20% of patients Subluxations and flexion deformities (Fig 69) are present in varying degrees Osteoporosis bone destruction fibrous ankylosis or bony ankylosis (Fig 70) may develop When initiating treatment, increased rest both mental and physical is important often it is best obtained by a short hospitalization Local rest to acutely painful joints may be provided by light splints or rest casts

Salicylates are still the mainstay for medication for both their analgesic and antirheumatic effects Provided there is no intolerance aspirin or sodium salicylate should be pushed to full therapeutic effects Buffered or enteric-coated preparations minimize gastric irritation With nausea or tinnitus the dosage should be reduced to just below the level where these undesirable effects occur continuing with 10-15 gr four times a day if tolerated Codeine may be used if night pain interferes with sleep

A balanced diet high in protein and protective foods is helpful Obvious focal infection should be removed using adequate antibiotic control to minimize dissemination of infection

Rest is important even after the subsidence of the acute symptoms Frequent brief periods of rest during the day are

(6) J Kentucky M A 54 771 779 September 1956

desirable with emphasis on the proper joint posture while resting

Daily corrective exercises are of great importance A detailed program must be planned so that all joints are placed through maximum range of motion daily Exercises may be repeated several times daily as tolerated. Locally dry or moist heat should be applied Massage may be helpful if well tolerated it should be directed to the muscles regional to

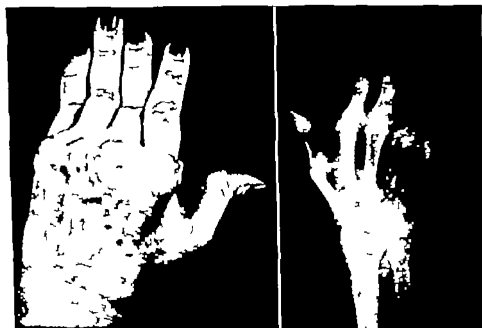


Fig 69 (left) —Subluxations and flexion deformities characteristic of rheumatoid arthritis.
Fig. 70 (right) —Osteoporosis, bone destruction and ankylosis.
(Courtesy of Sigler J W., and Ensign, D C. J Kentucky M A. 54 771 779 September 1956.)

the involved joints in the presence of acute or subacute joint symptoms and signs In many patients intra articular hydrocortisone acetate or hydrocortisone tertiary butylacetate will effectively relieve joint pain

Persistent and well directed local measures including the use of splints and rest casts when indicated are of real value in preventing contractures subluxations and ankyloses

Gold salts are at present the best available stopping mechanism The useful preparations are organic salts of

matoid arthritis of moderate or great severity involving the hands and feet

The prevalence of rheumatoid arthritis ranges from 1% for men and 3% for women with evidences of severe clinical rheumatoid arthritis confirmed by x rays and agglutination test to 11% for men and 27% for women with all grades of clinical disease including a past history of polyarthritis irrespective of laboratory findings Therefore precise diagnostic definition is essential for a study of comparative incidence of this disease in various populations

Rheumatoid Arthritis and What Can Be Done about It. John W Sigler and Dwight C Ensign[6] believe that early diagnosis of the disease and prompt treatment will speed remission and minimize deformities Physical findings in moderate and advanced cases show progression of muscle atrophy and limitation or even loss of joint motion Rheumatoid nodules appear in 15-20% of patients Subluxations and flexion deformities (Fig 69) are present in varying degrees Osteoporosis bone destruction fibrous ankylosis or bony ankylosis (Fig 70) may develop When initiating treatment increased rest both mental and physical is important often it is best obtained by a short hospitalization Local rest to acutely painful joints may be provided by light splints or rest casts

Salicylates are still the mainstay for medication for both their analgesic and antirheumatic effects Provided there is no intolerance aspirin or sodium salicylate should be pushed to full therapeutic effects Buffered or enteric-coated preparations minimize gastric irritation With nausea or tinnitus, the dosage should be reduced to just below the level where these undesirable effects occur continuing with 10-15 gr four times a day if tolerated Codeine may be used if night pain interferes with sleep

A balanced diet, high in protein and protective foods is helpful Obvious focal infection should be removed, using adequate antibiotic control to minimize dissemination of infection

Rest is important even after the subsidence of the acute symptoms Frequent brief periods of rest during the day are

(6) J Kentucky M A 54 771 779 September 1956

desirable with emphasis on the proper joint posture while resting

Daily corrective exercises are of great importance A detailed program must be planned so that all joints are placed through maximum range of motion daily Exercises may be repeated several times daily as tolerated. Locally dry or moist heat should be applied Massage may be helpful if well tolerated it should be directed to the muscles regional to

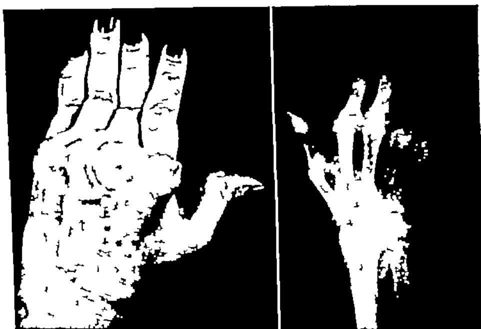


Fig 69 (left) —Subluxations and flexion deformities characteristic of rheumatoid arthritis.
Fig. 70 (right).—Osteoporosis, bone destruction and ankylosis.
(Courtesy of Sigler J W and Ensign, D C. J Kentucky M. A. 54:771-779 September 1956.)

the involved joints in the presence of acute or subacute joint symptoms and signs In many patients intra articular hydrocortisone acetate or hydrocortisone tertiary butyl-acetate will effectively relieve joint pain

Persistent and well directed local measures including the use of splints and rest casts when indicated are of real value in preventing contractures subluxations and ankyloses

Gold salts are at present the best available stopping mechanism The useful preparations are organic salts of

gold given intramuscularly The initial dose should not exceed 5 10 mg subsequent weekly doses are increased by 5 mg until a dose of 25 mg is reached This is repeated at weekly intervals as long as no signs of intolerance develop Each dose should be preceded by a urinalysis hemoglobin and white blood count Side reactions such as pruritus, skin rash stomatitis purpura or other hemorrhagic phenomena should be watched for It is sometimes possible to resume gold injections at a lower dosage level after minor manifestations of toxicity are controlled In many patients improvement is not evident until a total of 750-1 000 mg has been given When clinical improvement warrants the interval between injections is spaced to every two weeks for two or three months then to every three weeks for a similar period and ultimately to every four to six weeks. It is desirable to give a booster dose of the gold salts intramuscularly at least every six weeks for an indefinite period and in the event of a reactivation of the disease to return to the program of more frequent injections until remission again occurs

Corticosteroid preparations are useful supplements as suppressive agents in patients with actively progressing disease They are used concomitantly with the chrysotherapy with doses gradually diminishing as gold therapy becomes effective In many cases they may be necessary for only three to six months These preparations are also useful supplements in those patients who do not tolerate gold. Here again the dose should be carefully controlled and kept at the lowest level possible to keep the patient reasonably comfortable without attempting complete control of all symptoms Such steroids are given in divided doses and a total 24 hour intake exceeding 37 5 mg of cortisone 30 mg of hydrocortisone or 7 5 mg of prednisone or prednisolone is undesirable in long term administration

Phenylbutazone has not proved particularly effective in patients with peripheral rheumatoid arthritis

Clinical and Pathologic Study of 16 Cases of Rheumatoid Arthritis with Extensive Visceral Involvement (Rheumatoid Disease) is reported by R J G Sinclair and Bruce

Cruickshank[7] (Univ of Edinburgh) It has long been known that patients presenting arthritis of the rheumatoid type may have involvement of tissues other than the joints The occurrence of subcutaneous nodules is well known The systemic lesions can be classified into those which resemble the structure of the subcutaneous nodule and those which lack this histologic criterion Almost any tissue of the body may be involved The histologic appearances of the lesions in the second group are nonspecific. Those described in the spleen lymph nodes and kidney do not resemble the changes found in those organs in systemic lupus erythematosus Some of the vascular lesions seen in rheumatoid arthritis have also been described in systemic lupus but the presence of characteristic lesions in other organs has enabled the two conditions to be distinguished Amyloidosis found at autopsy in a significantly high proportion of cases of rheumatoid arthritis may be regarded as one of the systemic manifestations of rheumatoid arthritis Uremia is the most frequent cause of death in patients with rheumatoid arthritis and amyloidosis but several of the patients reported have had diarrhea due to marked involvement of the intestines

The authors describe 16 patients out of an autopsy series of 90 patients with rheumatoid arthritis who had widespread systemic involvement The main lesions encountered and their incidence was granulomata in the heart in five patients arteritis in nine pleurisy in seven splenomegaly lymphadenopathy and amyloidosis in four each and lymphorrhages in muscles and nerves in nine patients Rheumatoid endocarditis was present in eight patients with clinical evidence in seven Some combination of myocarditis, coronary arteritis or pericarditis was present in another five patients all of whom showed clinical features of cardiac involvement Unexplained pleurisy seemed to be very common in rheumatoid arthritis The visceral lesions of rheumatoid arthritis were the main cause of death in eight patients and a major contributory factor in another seven patients None of the lesions was considered to be the result of treatment

(7) Quart. J Med. 25:313-332 July 1956.

The authors feel that there is insufficient evidence to warrant the inclusion of rheumatoid arthritis in the group of collagen diseases

The Rash of Rheumatoid Arthritis and Still's Disease. Although rheumatoid arthritis is primarily a disease of joints, occasionally (more often in children than in adults) manifestations other than arthritis such as intermittent fever

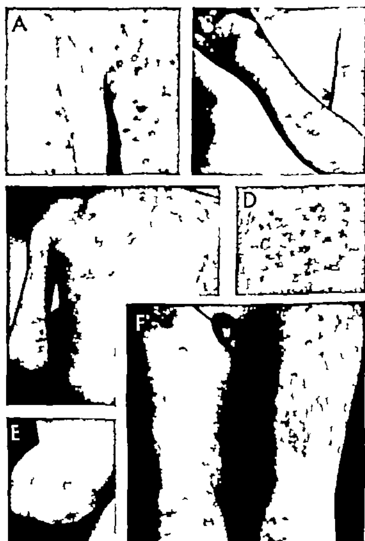


Fig. 71 —*A*, lesion following scratch. *B* typical peripheral involvement of limb. *C* grouped lesions on back, with florid rash on arm. *D*, lesions over extensor surface (knee) *E* rash in child, showing large lesion with pale centers. *F* pronounced areola of paler skin round lesions (Courtesy of Isdale, I C. and Bywaters, E. G. L.: Quart. J Med. 25 377 387 July 1956)

mphadenopathy splenomegaly pericarditis and iridocy-itis dominate the clinical picture. I C Isdale and E G L. ywaters[8] describe skin manifestations which have great iagnostic value particularly in patients seen early without rthritis Among 166 children with Still s disease a specific ash (Fig 71) occurred in 46 (27.7%) It was also seen in adults out of over 500 with rheumatoid arthritis The rash s frequently associated with intermittent fever spleno-negaly lymphadenopathy and other signs of activity of the isease, particularly a raised sedimentation rate It occurs haracteristically on the limbs (97%) trunk (82%) and ace (59%) is transient appears toward evening and with igh temperatures and does not spread It may last on and off for a week or for many years It appears usually within two weeks of the onset of the disease, or it may precede other manifestations by 6-36 months Histologically it is characterized by a sparse infiltrate of polymorphonuclear cells in the subepithelial layer Macule formation is inhibited by local injection of hyaluronidase but not by hydrocorti sone.

Periodic Benign Synovitis Idiopathic Intermittent Hydrarthrosis. Periodic benign synovitis is characterized by regular cyclic recurrence of articular pain swelling or limitation of motion without known provocation systemic reac tion permanent deformity of the joint or injury to the bone Although the knee is most frequently involved any peripheral joint may be affected Alan D Weiner and Ralph K. Ghormley[9] (Mayo Clinic and Found) reviewed the his tories of 33 females and 14 males aged 13-45

Pain found in 74% of patients was frequently present only when distention of the joint space was maximal and was often promptly relieved by aspiration of the fluid The involved joint was never intensely hot or red. Pain was not fibrositic in nature and pain and stiffness were never worse after inactivity or better after mild exercise Attacks started suddenly or gradually and usually lasted three to five days Only occasionally was onset of an attack associated with trivial trauma Some joints were involved singly and others

(8) Quart. J M 1. 25 377 387, July 1956.
(9) J Bone & Joint Surg. 38-A:1039 1055 October 1956.

coincidentally or alternately with some of the other joints.

In some patients the interval between attacks remained constant throughout the course of the disease. Duration of periodic benign synovitis is unpredictable. One patient with onset at the menarche was still having attacks at age 61. In other patients apparently spontaneous remissions of one to five years were followed by recurrence. Complete freedom from attacks without residual deformity can be expected in about half the patients.

Usually the sedimentation rate in a given patient was the same during an attack or a symptom free interval. No peripheral eosinophilia was noted. X-ray findings were mostly negative, the exception being evidence of thickening of the synovial membrane which was occasionally found when the examination was made during the height of an attack.

The histology of the synovial membrane was similar to that seen in rheumatoid synovitis. Many workers who consider this microscopic picture as pathognomonic of rheumatoid arthritis may conclude that periodic benign synovitis is a rare form of rheumatoid synovitis; those who consider that this histologic reaction is nonspecific may believe that periodic benign synovitis is a separate and distinct entity.

Medical management rarely brings relief. In patients with severe involvement of the knee joint, best results appear to follow synovectomy, but even this form of treatment is not completely successful.

Myofascial Pain Syndromes. According to Anders E. Sola and Robert L. Williams[1] (U.S. Air Force Hosp., San Antonio, Tex.), myofascitis is one of the most frequent causes of pain in a military population, although its importance has not been generally recognized. The syndrome may include pain (the usual complaint), stiffness, limitation of motion, tremors, weakness and manifestations of autonomic dysfunction. The pain pattern may be locally distributed, or it may radiate or be referred to a site at some distance from the point of stimulation. The commonest predisposing factor to this syndrome appears to be acute or chronic mechanical stress. Generally demonstrable are trigger areas—small hyperesthetic areas of tenderness in muscle or other

(1) Neurology 6:91-95, February, 1956.

connective tissue which on stimulation produce the syndrome Exploration of the skin with a neurodermanometer (which measures skin resistance when altered by sweating) demonstrates an area of deflection of the needle over the trigger point corresponding to an area of decreased skin resistance. Also stimulation of the skin in the region of the trigger point produces discrete erythematous areas over the trigger point The trigger points most commonly occur in the levator scapulae, infraspinatus trapezius pectoralis major quadratus lumborum gluteus medius tensor fascia lata, gastrocnemius and anterior tibialis muscles

The authors describe some of the more common syndromes—those involving the levator scapulae infraspinatus quadratus lumborum tensor fascia lata and anterior tibialis muscles—and locate the trigger points for these pain patterns Myofascitis of the levator scapulae is in their experience a common cause of torticollis The syndrome of meralgia paresthetica may be secondary to a trigger point in the tensor fascia lata

Treatment generally satisfactory consists of injecting saline solution or a local anesthetic (both about equally effective) in the trigger point. A possible explanation for the action of the saline injection is that it exerts pressure on the site of the trigger point and adjacent pressor receptors which in turn effect an alteration of the vasomotor activity in the area The evidences of autonomic dysfunction in this syndrome—including skin temperature variations altered sweat patterns reflex loss of joint range tremors and edema—are decreased or entirely relieved following saline injections

Some Observations on 520 Gouty Patients are reported by William C Kuzell Ralph W Schaffarzick W Edward Naugler Peter Koets Eldon A Mankle, Beverly Brown and Barbara Champlin[2] (Stanford Univ) Gout is a syndrome characterized by recurrent attacks of painful acute arthritis a tendency to localized urate deposition chronic polyarthritis and possible renal insufficiency Though it has been described predominantly in men in this study 373 were males and 131 females About half the patients had chronic

(2) J Chronic Dis. 2:645-669 December 1955

and half acute intermittent gout It occurred most frequently during the fifth sixth and seventh decades Only 9% of the females and 17% of the males were under age 40

Other painful musculoskeletal disorders were frequently found the commonest being osteoarthritis bursitis and peri tendinitis Coincidence of ankylosing spondylitis and gout, 4 8% for males and 3% for females was more than would be expected by chance. Rheumatoid arthritis occurred in 5 4% of the males and 7 6% of the females Obesity was present in 50% of all patients hypertension in 25 and 33 3%, thyroid deficiency in 20 and 33.3% and cardiac disorders in 10 and 1 5% of the males and females respectively

Diseases in the past considered prevalent among patients with gout were not prominent. Lead poisoning had occurred in only one and renal stone was noted in only 5% of the males and less than 1% of the females Renal insufficiency was infrequent and ocular disorders were present in about 8% of all patients

Eighteen patients died Death was caused by myocardial infarction in 11 (61%), renal failure in 2 carcinoma in 2 and cerebrovascular accident pulmonary embolism and cardiac decompensation in 1 each A recent study of actuarial data of life insurance revealed no increased mortality in gout as compared with that in the general population

In view of the association of gout and obesity atherogenic indices (index of coronary atherogenicity dependent on the ratio and total content of lipoprotein fractions) were determined in an unselected group of patients with gout. Nine patients with tophaceous gout showed an average atherogenic index of 108 In six patients without tophi the average was 107 5 The upper limit of normal in the same age group is less than 80

Effective agents for treatment of acute gouty arthritis included colchicine ACTH demecolcine and phenylbutazone Local injection of hydrocortisone was valuable as an adjunct. Less effective and often actually aggravating were cortisone hydrocortisone and prednisone orally Chronic gouty arthritis was apparently best managed by probenecid and phenylbutazone singly or in combination Phenylbuta

zone was the single most effective remedy for immediate termination of acute gouty arthritis, prevention of acute exacerbations and control of chronic gouty arthritis

Seven Year Observations on Treatment of Arthritis with Hesperidin Ascorbic Acid. Peter J Warter Henry L. Drezner Dominic A Donio and Steven Horoschak[3] studied 42 patients with rheumatoid arthritis and 17 with osteoarthritis All showed capillary fragility In patients with the most severe rheumatoid arthritis treatment was started with 600-1 000 mg hesperidin ascorbic acid/day orally When capillary fragility improved the amount was gradually decreased to a maintenance dose of 300 mg daily In the osteoarthritis group treatment was started and maintained with 300 mg daily

In the rheumatoid arthritis group normal capillary resistance was established in six to eight weeks from beginning of therapy and was maintained in 35 Fusiform swellings were reduced more quickly in patients in whom normal capillary resistance was established than in those in whom capillary fragility persisted. Sedimentation rate was also favorably influenced. Withdrawal of hesper-C for several months in a few patients resulted in flare-ups of the arthritic process which required larger doses and longer administration for control No patient died of vascular accident.

The osteoarthritic processes appeared to benefit from the therapy Despite the irreversible articular lesions the patients experienced less fatigue and less discomfort in the joints and showed general improvement.

The study shows that hesperidin with ascorbic acid can correct abnormal capillary fragility and permeability and thus enhance the efficacy of therapy directed against the arthritic state

Ochronotic Osteoarthritis was observed by Erkki Kallio[4] (Orthopedic Univ Clinic, Helsinki) in the following case

Man, 38, was hospitalized because of pain and stiffness in the left hip joint and backache. Physical examination revealed a decreased range of extension and flexion in the left hip where rotation, abduction and adduction were entirely absent. X ray films showed a nar

(3) J Am. Geriatrics Soc. 4:592 598, June, 1956.
(4) Ann. chir et gynaec. Fenniae 44 250-255 1955

rowed joint space in the left hip and flattened and calcified intervertebral disks.

Surgery exposed a charred, quite black and fragile trochanter major The caput femoris and acetabulum were black and white. Further studies revealed dark bluish concha and anthelix of both ears. The urine turned dark immediately on addition of alkali. The 24 hour urine contained 4-6 Gm. of homogentisic acid. The sweat was dark and the patient s underclothes turned black easily especially under the armpits His condition was diagnosed as alkaptonuria with ochronosis.

The ochronotic pigment is thought to be a polymer of homogentisic acid This type of pigment may also develop in melanuria or it may be caused by constant external use of phenol Ochronosis develops in only about one third of the alkaptonuria cases The disease may be either entirely asymptomatic or accompanied by pain and decreased range of movements in the shoulder joints hips knees and spinal column

Treatment is symptomatic. The secretion of homogentisic acid into the urine can be decreased by reducing the use of tyrosine and phenylalanine and with a diet rich in vitamin C.

Degenerative Arthritis Its Causes, Recognition and Management are discussed by Eugene F Traut[5] (Cook County Hosp Chicago) The origin of the disease is unknown It probably begins a variable number of years before clinical manifestations appear The upper extremity is involved more commonly in women than in men The lower back, pelvic girdle and lower extremities are predominantly affected in men Heberden s nodes formerly accepted as a pathognomonic sign are currently regarded rather as a bone and joint disease often accompanying degenerative arthritis The nodes resemble anatomically and roentgenographically the tufting of the phalanges seen in acromegaly Symptoms may be mild and limited to a squeaking or grating of the joints or the joints may be warm swollen and tender but usually not to the same degree on both sides. Moving or bearing weight on the leg often causes severe pain Relief is obtained by keeping the knee slightly flexed Even without moving the joint or standing pain can be persistent and severe enough to prevent sleep The muscles about the inflamed joint go into spasm in an effort to limit

(5) M Clin. North America 40 63-78 January 1956.

intra articular motion The sedimentation rate may be accelerated and the number of white cells increased Tendons ligaments muscles and bursae are often the seat of pain stiffness and tenderness This periarthritis is commonest about the shoulders at the side and base of neck and in the lumbosacral area Degenerative disease of the vertebrae can be responsible for syndromes resulting from pressure on nerve roots

Diagnostically suggestive of degenerative joint disease is pain or aching continuous or intermittent, in or about a weight bearing joint—the back hip or knee—in a person of middle age or older Characteristically the patient should not be really or apparently systemically sick with or from joint disease.

In general the prediction of relatively little disability can be made in many patients with degenerative arthritis

Treatment includes weight reduction correction of postural errors exercise combined with proper rest, and heat and massage Helpful drugs are aspirin phenylbutazone prednisone and prednisolone Hydrocortisone when injected into the joint, may markedly relieve pain and stiffness All treatment of degenerative arthritis is palliative aiming to reduce the painful evidences of the disease

Denervation of Hip Joint was performed by Luiz Gustavo Wertheimer[6] (Univ of São Paulo) on 50 patients (19 men and 27 women aged 14-79) with osteoarthritis On four bilateral denervation was done. The crural approach was used in 34 patients and the cruropelvic in 15 In only one patient was section of the obturator nerve trunk made via the pelvis

The results were good in 59.7% fair in 28 1% and poor in 12 5% The patients were followed for three to six years evaluation was based on effects of denervation of pain

Greater amplitude in the articular movements was achieved in 40 6% and in 46.8% the movements remained unaltered Neurotomy of the hip did not produce osseous articular alterations of the neuropathic type. On the contrary in some patients x rays revealed improvement of the articular lesions

(6) J I ternat. Coll. Surgeons 25:595-601 May 1956.

Despite successful results and extensive indications for arthroplasty there is still a place though restricted, for palliative procedures such as denervation which may be useful in some patients

Lesions of Cartilaginous Joints in Ankylosing Spondylitis. Histologic changes were studied by Bruce Cruickshank[7] (Univ of Edinburgh) in 18 cases In the manubriosternal joint, the earliest change was that of subacute osteitis followed by formation of granulation tissue which eventually replaced the joint structures and adjacent bone Later changes were fibrosis of joint and bone and ossification that progressed to complete synostosis

One symphysis pubis showed granulation tissue replacing bone and invading the joint the other showed fibrosis and osteosclerosis in one of the pubic bones In the intervertebral disks loose vascular fibrous tissue with little evidence of inflammation was replacing the nucleus pulposus the annulus fibrosus and sometimes portions of the adjacent vertebral bodies Ossification accompanied these changes and was the predominant feature in many disks Lateral bony bridges (syndesmophytes) occurred when ossification was extensive. Hyperplasia of bone also affected portions of the vertebral bodies

Changes in the manubriosternal joint and symphysis pubis closely resembled one another histologically and radiographically Changes in the disks in the later stages were essentially similar to those in the other two joints though some differences could be observed.

Identical lesions in the manubriosternal joint were found in 2 of 35 cases of rheumatoid arthritis No similar lesions were detected in 958 cases of nonrheumatic disease

(7) J Path & Bact 71 73 84 January 1956.

FRACTURES DISLOCATIONS AND SPRAINS

Internal Fixation of Fractures, according to Harrison L. McLaughlin[8] (Columbia Univ) causes minimal additional tissue damage and interferes to a minimum with continued function of the regional undamaged structures Indications for internal fixation embrace only a small percentage of all fractures and often depend as much on regional or systemic features as on x ray characteristics of the broken bone. Under appropriate auspices with skin that can be cleansed and shock that can be controlled internal fixation should be done as soon after injury as possible Strict aseptic technic is mandatory for avoidance of postoperative infection

The two common defects of internal fixation—breakage and tissue reaction—depend much more on manner of insertion than on metallurgic composition Incidence of these complications is negligible when Vitallium or stainless steel devices are applied with precision and adequate distribution of the load to be carried Use of enough internal fixation to obviate or minimize need for external splints often is a good policy for unless physiologic function of the part can be maintained safely throughout healing the elective operation is a failure Internal fixation of an open fracture though always a calculated risk greatly facilitates subsequent skin coverage, secondary closure or dressings

The greatest benefits derived from widespread use of intramedullary fixation include marked reduction of morbidity after major long bone fracture Pathologic long bone fractures stabilized by an intramedullary device remain comfortable and mobile pending the outcome of the bone disease.

Internal fixation properly used in suitable circumstances may effect many otherwise unattainable results

Significance of Biomechanical Factors in Bone Healing Some Cases of Transfixation of Diaphysial Fractures are reported by S Orell[9] (Stockholm) New bone formation re-

---

(8) Surgery 39 892-899 May 1956
(9) Nord. chir acta 23 1 22, April, 1956

sults partly from resorption and apposition in bone canals, as a reaction of living vascular intraskeletal connective tissue to necrotic trabeculae which occurs partly in the periosteum and partly in the endosteum in "tissue-free spaces" produced by surgery or by trauma. Consolidation of newly formed bone tissue occurs gradually during prolonged im-



Fig. 72.—Closed reduction in femur. *a*, immediately before operation; *b*, 10 months after operation; *c*, 17 months after operation. (Courtesy of Orell, S.: Helvet. chir. acta 23:1-22, April, 1956.)

mobilization. This should be so efficient that even micromovements are prevented.

In repair of fractures in which osseous continuity is disrupted, resorption, apposition (the final phase of bone repair) and consolidation are promoted by firm impaction of the fragments to simulate a compression fracture or fissure in which the fractured bone will function as if it were intact. In diaphysial fractures this is achieved most effectively by intramedullary nailing or transfixation ("osteotaxis"). Clini-

cally the callus is consolidated long before it assumes normal density on the x ray film about 12 24 months after operation Hoffmann s transfixation method more than any other demonstrates the importance of effective fixation of the fragments and makes muscular activity possible during bone consolidation

CASE 1—Man, 52 fractured both femurs On one side the break

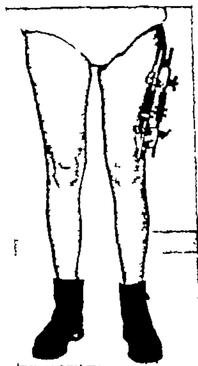


Fig 73—Two Hoffmann apparatus in place. Position, form and musculature of femur almost normal, with no shortening. (Courtesy of Orell, S.: Helvet. chir acta 23:1 22, April, 1956.)

extended through the knee joint. To avoid fixation, which might have led to stiffening of the joint, the fracture on the other side was fixed by Hoffmann s method allowing the injured knee some movement after a relatively short period. Closed reduction with fixation by moderate extension of the comminuted fracture was performed a week after injury (Fig 72, *a*) Six months later the Hoffmann apparatus was removed because of pain and decreased mobility of the knee. X rays were made 10 (72, *b*) and 17 months after the operation. The injured area first appeared normally calcified 17 months postoperatively (72, *c*) The knee had 90 degree motion and the leg was not shortened. He was still unable to work because of stiffness in the other knee due to intra articular fracture.

CASE 2—Woman, 36, had open reduction of malunited fracture

of the femur incurred in a skiing accident 16 months earlier Two Hoffmann apparatus were applied for fixation, and she was ambulatory a week later (Fig 73) and was able to do light household tasks. The apparatus were removed five to six months later The fracture was united, and motion in the knee joint increased rapidly to 95 degrees and 16 months after operation was 110 degrees. X ray density in the area of the fracture was then normal. Thigh musculature was normal and there was no leg shortening

► [This author has clearly shown the importance of active exercise, including early ambulation, in treatment of fractures of the lower extremities. He has demonstrated the fact that, by using a multiple pin transfixion method devised by Hoffmann, fractures of the femur or the tibia can be maintained with excellent alinement, position and contact between the fragments while permitting early weight bearing activities. Thus, atrophy of muscle and bone is prevented. The apparatus is particularly applicable for fractures with extensive comminution of fragments, in which an intramedullary rod would be contraindicated.—Ed.]

Recent History of Corrosion in Metal Used for Internal Fixation. In an outbreak of metal corrosion W H Cater and J H Hicks[1] (Birmingham Accident Hosp) found the incidence among stainless steel platings to be over 40% The fine thread Sherman type screw was always involved in the corrosion accidents Many second and even third and fourth operations were necessary because of corrosion, with delay in union and nonunion probably due to corrosion and a considerable amount of pain and distress from wounds that remained open for months or years It was found that the screws were made of a stainless steel called E.M.S This abbreviation refers to British Standard specification (B.S.) En 58M a stainless steel similar to F S L The latter refers to B S En 58E one of a group of steels containing about 18% chromium and 8% nickel En 58M contains a comparatively high proportion of manganese

The authors suggest that no other metal than F S L molybdenum steel or Vitallium be used Molybdenum steel refers to stainless steels of the 18-8 basic composition with 2-4% of molybdenum B S En 58J F.M B and 18-8 SMo are members of this group Chrome steel refers to the group of stainless steels containing 12 16% chromium but no nickel Vanadium steel denotes a group of nonstainless steels containing about 0 1% vanadium and small quantities of various other elements

(1) Lancet 2 871-873 Oct 27 1956.

All hospitals should check their theater stocks The equipment is simple consisting of a strong magnet and a bottle of a test reagent D L 12 (Howard and Partners, London) It is not difficult to differentiate strongly magnetic, feebly magnetic and nonmagnetic steels from one another Ordinary steel vanadium steel and chrome steel are strongly magnetic and highly corrodible In fact no metal that is strongly magnetic is safe and any item that is picked up with a click when the magnet is passed over the box must be thrown out. The D L 12 is a test for molybdenum in steel A spot of this fluid placed on the metal turns brown if there is a useful amount of molybdenum present All such items can be considered safe by present standards

Treatment of Ununited Fracture of Carpal Navicular by Styloidectomy of Radius is described by Lyman Smith and Barry Friedman[2] (Cleveland) who suggest that the pain associated with such a fracture is primarily caused by impingement of the radial styloid process against the distal navicular fragment Excision of the styloid process gave excellent results in 10 patients fair in 1 and poor in 2

TECHNIC.—The radial styloid process is approached through a 1½ in. incision placed directly over its center The cephalic vein is retracted dorsally and the superficial branch of the radial nerve identified as it courses over the deep fascia overlying the styloid process. The short extensor and long abductor tendons of the thumb are freed from their attachments to the dorsal ligament of the wrist and retracted volarward along with the radial artery The radial styloid is then freed subperiostally for about 1 in. Attached to its distal tip is the capsule of the wrist joint, which is thickened to form the radial collateral ligament. This is incised in the direction of the long axis of the thumb and the navicular is exposed. The distal fragment of the navicular is seen abutting the tip of the styloid with the wrist in even slight radial deviation. Removal of the styloid process is accomplished by osteotomy across its base at a point just proximal to the fracture line with the hand in radial deviation. The fracture line is then clearly seen and the distal fragment of the navicular will be found to move free of impingement on the distal portion of the radius. In closure, the capsule of the radiocarpal joint is sutured over the cut bony surface of the radius and is interposed between the bone and the tendons of the volar side of the wrist. The plaster splint is removed after 7 10 days and active motion is started.

( ) J Bone & Joint Surg. 38-A 368-376, April, 1956.

Fractures of the Triquetrum occur infrequently Noel F Bartone and R. Vincent Grieco[3] (New York) report on 46 triquetral fractures found over four years Common causes were injuries resulting from falls on the hand with forcible palmar flexion or with violent dorsiflexion of the wrist injuries to the dorsum of the carpus from direct blows and

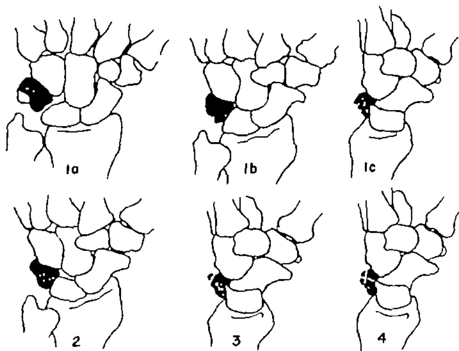


Fig 74 —Various types of triquetral fractures observed in authors series. 1a-1c drawings from x-rays of same case, showing necessity for multiple views; 1a, dorsovolar view which as a rule fails to demonstrate fracture, 1b semiprone oblique view; 1c lateral view demonstrating comminuted fracture of body and dorsum. 2 semiprone oblique view of comminuted fissure fracture; 3 lateral view of single dorsal chip fracture 4 lateral view of body fissure fracture with two dorsal chips. (Courtesy of Bartone N F., and Grieco, R. V J Bon & Joint Surg. 38-A:353-356 April, 1956.)

injuries associated with sudden resistance against twisting motions of the wrist such as may occur in lifting heavy sacks of mail Fracture is followed by pain swelling tenderness and restricted movement of the wrist. The various types are illustrated in Figure 74

Chip flake traction or avulsion fractures of the dorsal aspect of the triquetrum often do not unite and may form a permanent ossicle those that do unite usually take several

(3) J Bone & Joint S rg 38-A 353-356, April, 1956.

months to do so Fissure and comminuted fractures of the main part of the triquetrum almost always unite without gross deformity Nonunion is rare, and aseptic necrosis apparently does not occur Clinical or functional recovery usually occurs long before x ray evidences of bony union

New Method of Extension Treatment in Bennett s Fracture is reported by Lars Thoren[4] (Uppsala) In fracture

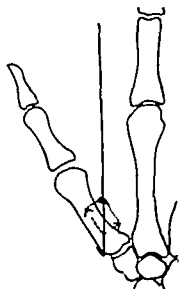
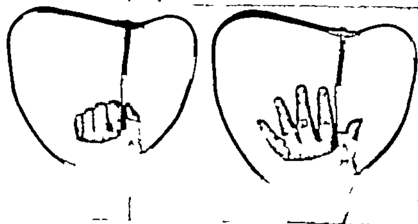


Fig. 75 (left) —Traction applied obliquely through base of first metacarpal bone.

Fig 76 (below) —Exercise of finger joints and two distal joints of thumb is possible. Racket splint can be made smaller

(Courtesy of Thoren, L. Acta chir scandinav 110 485-493 1956.)



dislocation of the first carpometacarpal joint, the volaro-ulnar fragment of the base of the first metacarpal bone becomes displaced dorsoradially and proximally due to muscular pull Traction intended to counteract this displacement

(4) Acta chir scandinav 110 485-493 1956.

should therefore be applied along the long axis of the first metacarpal bone with a force at the same time acting on its base in an ulnar and somewhat volar direction Traction by a wire drilled obliquely through the base of the first meta carpal bone in a distal ulnar and somewhat volar direction is applied the traction force thus has the ideal effect (Fig 75) A splint is fixed to the forearm by a plaster of paris bandage (Fig 76) The wire is then attached to the splint by strips of rubber to give light traction X ray control after



Fig 77—Direction of wire and hook. Follow-up showed excellent function. (Courtesy of Thoren, L.: Acta chir scandinav 110:485-493 1956.)

the operation and on the following days shows whether suitable traction is applied (Fig 77)

This method gave favorable results in 9 of 10 patients. The technic can be adapted to suit individual requirements risk of injury to important structures is small and good mobility is permitted in the joints of the thumb The method was also efficient in instances of flaky and perhaps com minuted fragments

Osteosynthesis of Medial Fractures of Femoral Neck Follow up Study with Special Reference to Capital Necrosis. Among 99 patients who had had surgery for medial fracture of the neck of the femur Hans Jensenius[5] (Odense, Den mark) found capital necrosis five years after surgery in 27% Pseudarthrosis was not observed in any patient without ne crosis Site of the fracture in the neck primary dislocation

(5) Acta chir scandinav 111 322 332, 1956.

reduction obtained and position of the nail in the neck each seemed to be of some importance in development of capital necrosis but none of these factors was decisive Capital necrosis is the crucial complication as far as the end result is concerned, mainly because of the arthritic changes after collapse of the head The clinical end result was good with no or slight discomfort in 76% of the 99 patients, but only in 33% of those with necrosis

End results of operative treatment are better than those of nonoperative treatment since the total number of capital necroses and pseudarthroses is smaller The following principles of treatment are important gradual reduction by skeletal traction extending over several days preservation of reduction thus obtained by operating on the patient in bed insertion of the nail steeply and centrally or slightly posteriorly in the neck, and avoidance of weight bearing for at least 12 weeks postoperatively

Use of Extra long Trochanteric Plate for Severely Comminuted Fractures of Upper Third of Femoral Shaft and Subtrochanteric Area is reported by W Compere Basom[6]



Fig. 78.—Skin incision after healing in patient with comminuted fracture of upper third femoral shaft. Femoral nail was easily inserted into central portion of femoral neck, through trochanter of short upper fragment. Extra-long plate was applied to hold this in fixation. Patient showed solid union and was doing well. Skin incision begins just posterior or dorsally to anterior superior iliac spine and extends posteriorly or dorsally and inferiorly or caudally to length sufficient to expose femoral shaft. Patient is on back, with knee to left. (Courtesy of Basom, W C.: J Internat. Coll. Surgeons 25:348-355 March, 1956.)

(El Paso Tex.) Management of extensively comminuted fractures of the femoral shaft in the upper third and subtro-

(6) J Internat. Coll. Surgeons 25:348-355 March, 1956

chanteric regions is extremely difficult at times. Use of skeletal traction has not been uniformly successful Nonunion is one of the many complications Basom found that an extra long trochanteric plate attached to a Smith Petersen nail can be used successfully to provide internal fixation of extensively comminuted fractures of the upper third of



Fig 79 —Anteroposterior view of extremely comminuted fracture of upper third of left femur three months after reduction and fixation. (Courtesy of Basom, W C J Internat. Coll. Surgeons 25 348-355 March, 1956.)

the femoral shaft and the subtrochanteric region in patients for whom internal fixation is necessary With the special technic required for application use of this plate has been successful (Figs 78 and 79) The fracture requires at least three months to unite firmly The procedure is extensive and should not be undertaken routinely

► [Many failures in treatment of comminuted fractures of the upper third of the femoral shaft and intertrochanteric area have resulted from use of a plate too short to be securely attached to the distal intact portion of the femoral shaft. The extra long plate with eight or more screw holes or

slots does give excellent fixation for maintaining reduction and alinement.—Ed.]

Supracondylar Fractures of Femur Treated by Internal Fixation with Immediate Knee Motion Edgar H White and Lester A Russin[7] (Cincinnati) recommend the following method for treating supracondylar fractures of the lower end of the femur Casting is omitted

TECHNIC.—The Blount nail is inserted through a lateral approach



Fig. 80.—Comminuted supracondylar fracture with excellent reposition of fragments despite short distal femoral fragment. (Courtesy of White, E. H., and Russin, L. A. Am. Surgeon 22:801-820 August, 1956.)

(7) Am. Surgeon 22:801-820, August, 1956.

in most instances but in a few cases more satisfactory fixation can be obtained by insertion through a medial incision. Medial insertion is advisable when the injury leaves a distal fragment with a short lateral cortex. Careful positioning of the pneumatic tourniquet at the highest level of the thigh is compatible with adequate exposure. With the patient lying in the lateral position with the injured thigh uppermost, a vertical lateral skin incision of 8-10 in. is adequate. Anteroposterior and lateral x rays are taken and if these reveal satisfactory position of the Blount nail, the plate is fastened to the shaft of the femur by adequate screw fixation (Fig 80) If a medial approach to the lower end of the femur is deemed advisable, the patient should be anesthetized in the supine position with the opposite hip elevated on a sandbag followed by external rotation of the involved leg plus flexion of the knee joint to almost a right angle. It is important that true lateral x rays be obtained at the time of surgery Before release of the pneumatic tourniquet, a compression dressing consisting of several rolls of sheet wadding followed by application of two 6 in. elastic dressings is then applied. This dressing is left undisturbed for 48 hours When it is removed, the patient is placed on hourly flexion exercises over the edge of the bed. Quadriceps-setting exercises are started the day following surgery

This technic reduces incidence of chondromalacia of the patella and results in shorter hospitalization Fixation of the cortex of the opposite femoral condyle appears to be nonessential Internal fixation may be employed at the time of the original surgery in certain selected open fractures. Formal physical therapy is unimportant in obtaining satisfactory results Poor results have been due to errors in surgical judgment rather than to failure of the method of treatment.

► [The importance of early motion in any joint, especially the knee, following a fracture of a bone or bones in an extremity is slowly becoming recognized by surgeons who treat injuries produced by trauma. A method of internal fixation of supracondylar fractures of the femur which is equally effective to that presented in this article, and one preferred by the editor is that of Rush, in which two intramedullary nails are introduced laterally and medially through the condyles of the femur —Ed.]

Fractures of the Tibial Condyle Clinical and Experimental Study Mason Hohl and J Vernon Luck[8] (Los Angeles) observed in rhesus monkeys that immobilization in the presence of defects created in the articular cartilage and articular cortex of the femoral and tibial condyles led to early formation of a heavy core of adhesions having their origin in the infrapatellar fat pad When free motion was permitted no adhesions formed in the crater of the defect

(8) J Bone & Joint S rg 38-A 1001 1018 October 1956.

in either the tibial or the femoral condyle and there was strikingly better progress in the healing process with less synovial reaction The healing of these experimental defects occurred by ingrowth of fibrous tissue through the subchondral marrow spaces and to a lesser extent from the margins Vessels and their fibroblastic scaffold were observed to grow in replacing the area of the defect with granulation tissue which then underwent fibrous condensation. As function was restored this fibrous tissue was transformed into fibrocartilage which could ultimately differentiate into hyaline cartilage The transformation into hyaline cartilage was generally spotty and could be expected to occur only in areas subjected to the greatest friction and pressure during joint movement.

The authors analyzed 726 tibial condylar fractures in human beings with follow up studies of 2 13 years in 227 patients Avulsion chip or sprain fractures were not included

The follow up studies on unreduced fractures revealed remarkable recovery of painless motion despite lack of reduction demonstrated by x rays However a cosmetically undesirable valgus or varus deformity persisted Open reductions showed at least as much recovery of function as comparable cases treated by conservative means Improvements in surgical technic, especially in the use of bone grafts and internal fixation will undoubtedly allow much better functional results by eliminating prolonged postoperative immobilization

Conservative treatment is indicated in undisplaced fractures local depression fractures with displacement of less than 1 cm and split fractures with displacement of less than ½ cm Manipulation under anesthesia with traction is indicated in total depression fractures and in split fractures with shattering of the upper tibial surface Open reduction is indicated in local depression fractures displaced more than 1 cm total depression fractures irreducible under anesthesia and split fractures with displacement of more than ½ cm

Early active motion is most important in obtaining optimal results in fractures of the tibial condyle

Vascular Disturbances Associated with Fractures are reviewed by Ferdinand F McAllister[9] (Columbia Univ) Early disturbances include injury or division of the main artery of supply to the affected extremity compression of the main artery by hematoma or occlusion by angulation and severe vasospasm simulating occlusion The role of spasm is best evaluated by a nerve block. If the result of the block is slight or there is considerable hematoma or other findings suggesting compression of or actual injury to the artery exploration of the vessel should be considered. If the signs indicate that the vessel may be ruptured or if a large hematoma is present careful control of the main artery above and below the area of hematoma is important If the vessel is ruptured or badly traumatized the injured segment should be excised and rejoined by end-to-end anastomosis or replaced with a prosthesis which may be an autogenous vein a preserved homograft or a plastic cloth tube of suitable material such as Vinyon N or Dacron.

Later complications consist of secondary hemorrhage, aneurysm formation arteriovenous fistula and so-called post traumatic reflex sympathetic dystrophy Secondary hemorrhage is commonly related to necrotizing infection though occasionally it may result from rupture of an undetected or false aneurysm secondary to the initial trauma In this case replacement of the blood vessel is indicated

If diagnosis of arteriovenous fistula is questionable, an arteriogram may be of help Treatment is surgical

In post traumatic reflex sympathetic dystrophy a regional sympathetic nerve block will quickly tell whether or not sympathectomy will bring relief and if causalgia is severe a sympathectomy should be done.

Frontal Tomography in Fractures of Calcaneus. P Decoulx M Ducloux and G Jacques[1] (Lille, France) believe that frontal tomography might be exceptionally useful in fractures of the calcaneus Frontal x ray films are useless because superposition of the soft parts and tarsal bones makes it impossible to interpret the extent of injury sustained by the calcaneus itself For some years detailed ana

(9) Bull New York Acad. Med 32 127 132, February 1956.
(1) J radiol et electrol 37 375 379 May June, 1956

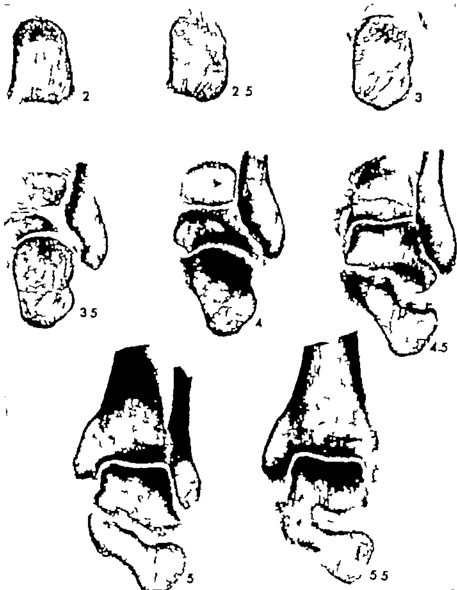


Fig 81 — Anatomic sections, made every 0.5 cm., arranged from left to right and top to bottom, from plane 2 farthest back. Thalamus is visible from planes 3-5.5. Convex toward the back, it becomes smooth and slightly concave toward the front, decreasing progressively from back to front and from interior to exterior. Sustentaculum tali appears at plane 4.5 contributing to biscuit-like appearance. Section of tarsal sinus appears at this level and is clear at plane 5, growing wider toward exterior and giving to next plane the aspect of notch or defect, suggesting partial detachment. Visible from plane 3.5 on, section of inferior tibioperoneal articulation is most distinct in planes 4 and 4.5. (Courtesy of Decoulx, P., et al. J radiol. et electrol. 37.375-379 May June, 1956.)

tomic studies of the calcaneal region have been made, using serial frontal sections showing the aspects of the subastragalar articulation (Fig 61) Numerous tomographic studies of persons with and without calcaneal lesions proved that four sections taken on one 24×30 film at intervals of 0.5 cm starting from the posterior edge of the external malleolus will adequately demonstrate all possible calcaneal displacements The films should be overexposed and underdeveloped to avoid pronounced contrasts

Tomographic films thus made provide the surgeon with precise information about the extent and type of bone damage on which he can base immediate treatment, enabling him to avoid the useless and harmful operative procedures often tried in patients with calcaneal fracture. Frontal tomography is also helpful later in the interpretation of vicious callus formations which interfere with walking and constitute one of the chief causes of late failure in surgical treatment

---

THE SPINE AND PELVIS

Fracture of Odontoid Process Report of 63 Cases. Fracture of the odontoid process is not uncommon Edwin W Amyes and Frank M Anderson[1] found marked nuchal rigidity and severe pain in the neck and suboccipital region to be the prominent features Neurologic involvement noted in 11 patients varied from occipital hypalgesia to fatal paralysis Incomplete compression of the anterior spinal cord near the pyramids produced various extremity paralyses, most commonly of the arms as well as alterations of pain and temperature sense Diagnosis was established by x ray for no clinical findings were specific for this fracture Treatment generally included bed rest traction preferably in Crutchfield tongs and immobilization of the head and neck in a steel reinforced leather collar Operative fusion of the upper two cervical vertebrae was performed in one patient.

All but three fractures healed or became immobilized

(1) A.M.A Arch S rg 72 377 393 March, 1956.

after four to nine months of treatment. The three failures were the result of inadequate or improper treatment, and operative fusion was indicated. Five patients died, two after spinal cord compression more than a week after the accident, two of associated injuries and one of complications of meningitis.

In almost 25% of persons between 30 and 50 there is incomplete bony union between the odontoid and the body of the axis which may predispose to fracture or poor healing.

Hoarseness and Painful Deglutition Due to Massive Cervical Exostoses are reported by Charles V. Heck[2] (Univ. of



Fig. 82.—Large exostosis at level of 3d and 4th cervical vertebrae, with incomplete ankylosis. (Courtesy of Heck, C. V.: Surg., Gynec. & Obst. 102:657-660, June, 1956.)

Illinois) in four patients aged 62-71. In cervical exostoses due to osteoarthritic changes, the complaints of hoarseness and difficulty in swallowing may be outstanding. The esophagus is interfered with by the direct encroachment upon it of a large spur, with an early mechanical block. Edema of the adjacent soft tissues, scar formation or the presence of

(2) Surg., Gynec. & Obst. 102:657-660, June, 1956.

a tumor in the esophagus (in one patient) aided in producing the block Hoarseness sometimes with a nonproductive cough develops gradually One patient complained of dyspnea and a sensation that the tongue was swollen Pain in the cervical spine area or radiation of pain from the neck region was not a major complaint Motion of the cervical spine was limited in all four patients

X ray films showed many changes Multiple adjacent joint levels were involved in each instance with ankylosis of some of the segments In three patients considerable new bone formation was located at a level where motion was still present The proliferation of a large amount of bone suggests a prolonged attempt at ankylosis Motion of the involved joint or joints over a long period of time plays a part in producing large spurs since proliferation of bone would be expected to stop when complete bridging occurs (Fig 82) Swallowing of barium may outline the esophagus and permit determination of the amount of anterior soft tissue reaction A firm bony mass may be palpated anteriorly in some cases Endoscopy allows determination of the presence and extent of extraesophageal obstruction but may be of no value if the mass is too great

Resection of the bony mass is often prevented by the patient s age poor general health and technical difficulties. Gastrostomy must be resorted to when poor nutrition is significant

Discography in Evaluation of Lumbar Disk Lesions was performed by Jack Friedman and Meyer Z Goldner[3] (Minneapolis) in 150 patients aged 17-66 with long standing incapacitating back pain in whom surgery was considered and clinical localization or myelography was inadequate 427 disks were injected Figure 83 shows the position of the needles and the discogram After injection of the contrast material the 2d 3d and 3d-4th lumbar spaces were normal with no pain on injection The 4th 5th lumbar showed degeneration marked posterior protrusion and epidural leak injection caused pain in the back and down both legs The 5th lumbar to the 1st sacral showed a congenitally narrowed disk in transitional vertebrae with degeneration in

(3) Radiology 65 653-662, November 1955

jection invariably caused pain down the left leg (Fig 84)

In almost all instances injection was made in three spaces in attempt to evaluate extent of the disease in the presence of limited clinical localizing findings Unsuccessful attempts were few and occurred mostly in the 5th lumbar to the 1st



Fig 83 (left) —Control lateral film with needles in position in four spaces before injection of contrast medium.
Fig 84 (right) —Discogram after injection of contrast medium.
(Courtesy of Friedman, J., and Goldner M Z: Radiology 65:653-662, November 1955)

sacral space. Only 50 patients showed a single offending disk space The number of cases with disk degeneration with posterior epidural leak was greatest at the 4th 5th lumbar and the 5th lumbar to the 1st sacral. In most patients with epidural leak, pain was elicited suggesting that sclerosis and the inflammatory process associated with degeneration are a part of the mechanism causing back pain Reproduction of pain on injection of the contrast medium

proved to be a valuable sign in determining the offending nature of the disk

In 50 patients pantopaque* myelography was also performed In only 14 of these did the myelogram and discogram agree completely as to negative or positive findings 22 showed complete disagreement One reason for myelographic failure is that the anterior aspect of the subarachnoid sac is posterior to the vertebral bodies over the 4th-5th lumbar and the 5th lumbar to the 1st sacral levels.

Surgery was performed on 96 patients In no instance was a disk that was interpreted as offending at discography found to be negative on exploration

► [In addition to being an accurate method of diagnosing degeneration of an intervertebral disk, discography does not produce headaches, such as those which so frequently follow myelography —Ed.]

Reaction of Intervertebral Disks to Compression Forces was studied by Carl Hirsch[4] (Karolinska Inst Stockholm) In attempt to elucidate the pathologic mechanism of back traumas Hirsch loaded and subjected to a fast acting blow fresh lumbar intervertebral disks

A loaded spine does not have the same ability as an unloaded one to compensate for even a minor sudden extra strain If a person without an extra burden falls down or if he is hit by a falling object the intervertebral disk will absorb the strain easily because the demands on the elasticity of the disk are less in a person bearing only the weight of his body If the spine is under pressure e g if the person is carrying a heavy burden the disk is compressed closer to its elastic limit A sudden impulse as seen in Hirsch s experiments causes additional compression which may at its maximal amplitude exceed the elastic limits of the collagen system somewhere in the annulus of the cartilaginous plate or of the attachment of the collagen to bone resulting in rupture

It is not the violence itself that decides the extent of injury but the trauma combined with the condition of the disk at the time the force is applied The sensation of something rupturing or snapping in the back often reported by patients may be a sign that some stress limit was exceeded and that rupture occurred somewhere in the disks

(4) J Bone & Joint Surg 37 A 1188-1196, December 1955

The mechanical properties of the disk change with age. Above 30 almost everyone has more or less marked ruptures in the annulus structure in the lowest interspaces From 30-50 degenerative changes occur in the annulus and nucleus in most of the lower lumbar disks which presumably alter the mechanical properties decreasing ability to with stand mechanical forces Later the interspace is changed into a more dense fibrous material protected by osteophytes and surrounding connective tissue elements Perhaps as a result of this it becomes better able to stand stresses

► [The completely normal intervertebral disk is as firm and as crisp as a fresh stalk of celery The experimental work of Hirsch confirmed what I have believed and taught for many years—that a normal intervertebral disk cannot be extruded as a result of stress or strain placed on it by lift ing or by any single trauma. When a disk is extruded as a result of a lifting strain, when a patient bends over to pick something up off the floor or when such an extrusion results from slipping and falling down in a sitting position, it is reasonable to assume that there were already present degenerative changes within the disk substance before the stated injury occurred.

The intervertebral disk changes as the patient grows older In infancy the central portion, which has been called the nucleus pulposus, is essentially fluid. It is similar to the material that is found in a ganglion. In the young adult the central portion is pulpy and the annulus fibers are firm and crisp. In the patient aged 50 or over even though he may never have done any heavy work, the central portion of the disk is dry and fragmented. These are factors of deterioration through aging quite comparable to the graying of the hair and wrinkling of the skin.—Ed.]

Back Disability 1930-55 Exum Walker Franklin C Miles and James R. Simpson[5] (Atlanta Ga) state that x ray visualization of the spine may suggest disk disorder by demon strating hypertrophic reaction about the margins or narrowing of the disk These changes represent tissue responses to the chronic strain of function and injury and therefore in dicate *a strained or damaged disk* They occur more com monly in the lower cervical and lower lumbar regions where the physical stress of weight bearing is greatest. Use of radiopaque dye usually is necessary for the more accurate diagnosis required in planning corrective surgery Myelography and discography are procedures used in the latter diodrast* is injected into the central nuclear regions of the suspected disk

The surgical treatment generally accepted is removal of the intervertebral disk. This operation is most useful in ...

(5) Am. Surgeon 21 1112 1120 November 1955

control of unilateral sciatic pain in a patient who is in a position to restrict his activities It is a much less radical procedure than one which includes stabilization about the disk

For the patient who is disabled from back or sciatic pain and who is not in a position to limit his activities a suitable procedure is removal of the disk and grafting done by re-

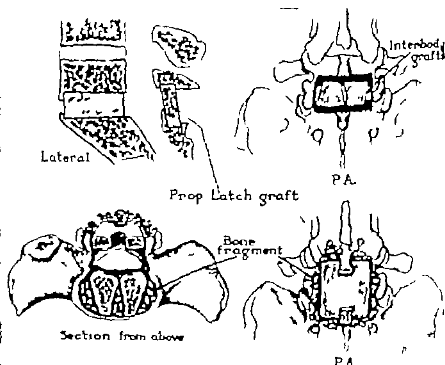


Fig. 85 —Technic used to obtain anterior interbody and dorsal interlaminar fusions (Courtesy of Walker E. et al Am. Surgeon 21:1112-1120 November 1955)

moval of the cortical end plates of the adjacent vertebral bodies and interposition of grafts of bone taken from the iliac crest While the vertebrae are forced apart the bone plugs are seated with sufficient snugness to insure their retention sustain the width of the disk space and offer immediate structural stability The facets and laminal arches then are grafted dorsally with bone fragments and finally a prop-latch H graft is interposed between the spinous processes, insuring adequate stability for the affected segment (Fig 85) When this procedure is satisfactorily done no brace or

support is necessary after surgery and the patient may be permitted out of bed as quickly as postoperative discomfort permits

Treatment of Low Back and Sciatic Pain by Injection of Hydrocortisone into Degenerated Intervertebral Disks is described by Henry L. Feffer[6] (George Washington Univ) The effect of local instillation of hydrocortisone into the acutely swollen intervertebral disk of 60 patients was tested by combining the injection with a nucleogram Only one injection was made The nucleogram served a dual purpose the immediate condition of the disk was determined and the nature of the ensuing clinical response to hydrocortisone could be evaluated and related to the state of disk degeneration The maximal follow up period was eight months

Nucleograms of 55 patients demonstrated pathologic lesions of the intervertebral disks Rapid remission of symptoms after injection of hydrocortisone was observed in 37 patients (67%) while 18 (33%) failed to respond In 16 of the latter surgical exploration of the involved disks demonstrated irreversible changes

These results suggest a method of rapidly interrupting the course of an acute intervertebral disk herniation as well as demonstrating early in the course of the episode which disks are destined for surgical intervention despite adequate conservative care In this way much morbidity and economic loss can probably be averted.

Prognosis in Conservatively Treated Sciatica was studied by Lennart Soderberg[7] (Malmö Sweden) in 300 patients All had neurologic signs at the time of hospitalization Treatment was uniform consisting of bed rest and physical therapy Interval between hospitalization and follow up was 8-23 years There were no sciatic symptoms before hospitalization in 189 patients Complete freedom from symptoms during the first eight years after hospitalization was noted in 37% and during the interval between hospitalization and follow up studies in 34%

Occasional mild complaints during the eight year period were reported by 20% usually of the insufficientia dorsi

(6) J Bone & Joint Surg. 38-A 585 592, June, 1956.
(7) Acta orthop. scandinav., supp. 21 1956.

type and often reported as occurring only in association with heavy work or on exposure to cold Rather constant symptoms of varying severity with or without recurrences were recorded in 33%

At the time of the study 52% of the patients were symptom free Of those not completely symptom free 28% had back symptoms only 16% both back and sciatic symptoms and 4% sciatic symptoms only

Sciatic symptoms were reported with a higher frequency than back symptoms during the first four years after hospitalization The sciatic symptoms decreased with time usually they were accompanied by back symptoms The frequency of back symptoms only however was fairly steady throughout the period of investigation

There was no difference in the later course between patients doing heavy manual work and those doing light non manual work or between patients who at the time of initial onset of sciatica were under 30 between 30 and 40 or over 40

Complete freedom from symptoms was less common and the frequency of back symptoms only higher among those with a pronouncedly changed back. In a comparison of those who were completely symptom free before hospitalization and the remainder more of the former were completely symptom free during the eight year period and up to the time of the review Between patients with indications for operation and those without frequency of sciatic symptoms during the eight year period was somewhat higher for the former but no difference was found in severity and nature of symptoms also total periods of hospital care and disability were longer and incidence of permanently decreased working capacity higher among the former

In 40% there were recurrences between the initial attack of sciatica and the time of follow up After hospitalization incidence of recurrences was about 21% Recurrences were commonest within the first five years of initial onset. Frequency of recurrences after hopitalization was independent of sex age at initial onset occupation or other factors studied

First Lumbar Root Syndrome is a variable pattern of pain of skeletal origin occurring over part or whole of the 1st lumbar segment, unilaterally or bilaterally with definite areas of usually well localized tenderness O W Leitch[8] (Adelaide) describes this common symptom which may be confused with visceral pain patterns and with symptoms of other musculoskeletal disorders The origin of the pain is probably within the apophysial joint from root irritation subsequent to traumatic arthritis or to osteoarthritis An important factor in the genesis of the syndrome is the occasional anatomic instability of the junction between the 1st and 2d lumbar vertebrae or between the 12th thoracic and 1st lumbar vertebrae. Although pain distribution may be over the entire segment (corresponding to the posterior primary ramus and the iliohypogastric and ilioinguinal components) localization is generally over a small area. The sites of maximal pain and tenderness are often at the edge of the erector spinae opposite the center of the 12th rib in the iliac fossa near the edge of the rectus abdominis close to McBurney s point or more medially or in the lower part of the iliac fossa in the case of ilioinguinal involvement. Onset of pain often follows injury The pattern of pain may resemble that in renal colic or pyelitis appendicitis diverticulitis inguinal hernia tubo-ovarian abscess backache strained abdominal muscles or hip joint disability

Treatment for this condition may consist of fixation of the unstable joint by external bracing or by spinal fusion of the two the more satisfactory method has been fixation of a no 2 curved plate to the spines of the 12th dorsal and 1st and 2d lumbar vertebrae with subsequent insertion of a cancellous bone graft and partial apophysectomy More frequently however surgery is not necessary and relief can be obtained by lumbar root block with local anesthetics In this technic, the needle is advanced to the transverse process of the 1st lumbar vertebra then angled to pass below it a further ½ ¾ in to where the nerve is situated Frequently the pain pattern will be accurately reproduced during needling or injection of the anesthetic. Lasting relief is sometimes obtained with a single nerve block.

(8) M. J Australia 2:842-846, Nov 19 1955.

Lumbosacral Fusion Results with Early Ambulation were studied by Melvin Brent Watkins and Everett C. Bragg[9] (New York Orthopaedic Hosp.) in 106 patients, aged 16-60 who underwent fusion of the lumbosacral spine for mechanical or structural defects and were ambulatory during the second to third weeks after operation. The Hibbs fusion method was the basic technic used.

Pseudarthroses occurred in 14 of the patients whose average age was 40. There were no occupational variations in these compared to the group as a whole. The incidence of pseudarthrosis was about doubled when the 4th lumbar vertebra was included in the fusion. Of the 14 patients in whom solid fusion failed to develop 6 (43%) had no significant symptoms.

► [I have for many years advocated early ambulation following operations at the lumbosacral level, including fusions from the 4th lumbar to the 3d sacral. Patients have been helped to sit up with their legs dangling over the side of the bed on the fourth or fifth day. On the sixth or seventh day they are permitted to stand and to take a few steps with the assistance of nurse or physician. Within 10 days they have bathroom privileges. No cast or brace is used until the stitches have been removed on the twelfth or fourteenth day after surgery. One year after operation these patients are re-examined, and x rays are made with the patient bending forward, backward and to each side. Our patients have no higher incidence of pseudarthrosis than did patients who were kept in bed for three months after a spine fusion operation. The end results are better than they were in the earlier days of prolonged immobilization.—Ed.]

Vertebral Body Fusion for Ruptured Lumbar Disks: Roentgenographic Study. Vertebral body fusion for the treatment of ruptured lumbar intervertebral disks was first performed by Ralph B. Cloward[1] (Honolulu) who did this operation on 427 patients. He now reports on a clinical and x ray follow up study of 354 of them (made six months or longer after operation). He believes (1) that, once a disk is ruptured, it will result in an abnormal joint of the spine which may eventually cause symptoms; (2) that since nature is unable to repair or completely compensate for loss of the nucleus pulposus, the patient has a greater chance of having a strong painless lumbosacral spine if he has a fusion operation than if he does not; (3) that more patients subjected to a fusion operation can be cured by fusing the vertebral bodies than by the conventional posterior type of opera-

(9) S. rg., Gynec. & Obst. 102: 604-606, May 1956.
(1) Am. J. S. rg. 90: 969-976, December 1955.

tion (Figs 86 and 87) and (4) that simple disk removal has been shown to result in only half as many cures as the operation of vertebral body fusion Therefore, the author performs this operation on all patients with ruptured lumbar disks

Cloward found that by vertebral body fusion (after complete disk removal) combined with posterior fusion he was able to relieve permanently 15-40% more patients of all symptoms than was possible when he used other operations



Fig 86 (left) —One week after operation for anterior and posterior fusion. Three large grafts (obtained from patient's ilium) replace the 4th lumbar disk. Note bone crumbs over lamina.

Fig. 87 (right) —Eight and a half months postoperatively Patient never relieved of back pain. Interbody and posterior grafts have absorbed. Note narrowed interspace and subarticular sclerosis.

(Courtesy of Cloward, R. B. Am. J Surg 90:969-976, December 1955)

This high percentage of cures is attributed to the removal of all potentially painful soft tissues which contain nerve elements i e. the facet capsule and the posterior annulus adequate decompression of the nerve roots by removing all disk tissue and bony osteophytes which encroached upon them and the facts that the width of the intervertebral space and size of the intervertebral foramen is restored with interbody grafts and only the one pathologic joint is fused in the normal position

Fusion verified by x rays occurred in three to five months the average time necessary for the interbody grafts to fuse. Solid interbody fusion was found in 328 patients

(93%) Failure of fusion in 26 (7%) was due to absorption of the grafts, the cause of which was undetermined

► [Vertebral body fusion is more likely to succeed in providing complete stabilization of the spine than any other type of fusion. The operation is more difficult to perform, and the hazards are (percentagewise) greater than those of the posterior fusion of laminae and articular facets. When the technic is correctly performed as described by Cloward, vertebral body fusion is a procedure which should afford satisfactory end results.—Ed.]

Major Vascular Injuries Incident to Intervertebral Disk Surgery are discussed by James R. Mack[2] (Univ of Cincinnati)

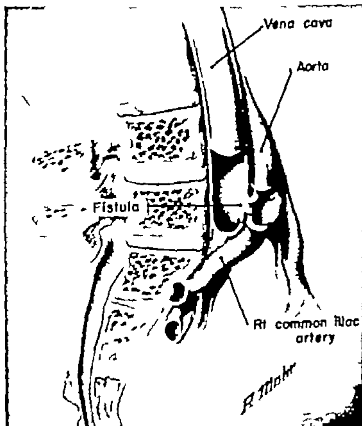


Fig 88.—Fistula (lateral view) demonstrating close relationship between major vessels and anterior ligaments of spine. (Courtesy of Mack, J R. Am. Surgeon 22 752 763 August, 1956.)

nati) Major vessel injury is an ever present hazard because of the close relationship between the major vessels and the anterior ligaments of the spine (Fig 88) The injury is not usually manifested by excessive bleeding and so must be

(2) Am Surgeon 22 752 763 August, 1956.

recognized by careful clinical evaluation of the postoperative state and awareness of the danger of this complication

Prompt recognition and treatment is the only method of reducing the disastrous mortality rate. Treatment may vary according to the site and extent of the injury Restoration of the continuity of the injured vessels by suture or arterial graft may be desirable but is by no means always essential ligation alone may in some instances be simpler and safer

The common iliac artery the most frequent site of injury can be ligated with relative impunity because of its extensive collateral circulation An arteriovenous aneurysm involving the common iliac artery can be treated by ligation of the artery above and below the fistula leaving the small segment of artery attached to the vein because of the absence of branches in this portion of the artery

The prone position of the patient on the operating table with anteflexion of the spine compresses the major vessels against the spine, thus putting them in an extremely vulnerable position and masking the injury when it does occur

The pituitary forceps is the instrument most commonly responsible for vascular damage.

Infection of Intervertebral Disk Following Operation for Protrusion of Nucleus Pulposus is an uncommon complication C H Lenshoek[3] (Groningen Univ) observed it in three patients A confusing factor in its diagnosis is the phenomenon of an apparently uneventful wound healing General manifestations of infection are seen but these are easily misinterpreted as being due to the preceding operation Local back pain and spasms of the erector spinae muscles are an indication but are by no means pathognomonic X ray findings are decisive. If x ray examinations are systematically made from the onset, local atrophy of adjacent vertebral bodies is first seen with a vague outline of the cortical layer A subsequent stage shows narrowing of the intervertebral space marked destruction of the vertebral bodies may occur Healing is demonstrated by ossification which may result in bony fusion of the vertebral bodies (Fig 89)

These clinical and x ray features are also encountered in

(3) Arch. chir neerl. 8:57-66, 1956.



Fig. 89 —Eighteen months postoperatively (Courtesy of Lenshoek, C. H. Arch chir neerl. 8:57-66, 1956.)

disk infection following lumbar puncture in meningitis patients and after discography. It is questionable whether a bacterial infection is involved in all these cases. Primary necrosis of the disk tissue may give rise to similar changes, and there may be transitions from true bacterial infection to necrosis of the disk with secondary symptoms of infec

tion Tuberculous spondylitis must be considered in differential diagnosis particularly if meningeal manifestations follow an operation for herniation Repeated radiologic examination and the clinical course aid in diagnosis

Immobilization and antibiotics especially when applied in the early stage give good results

Natural History of Osteoid Osteoma of Spine Review of Literature and Report of Three Cases. Alvina O Sabanas

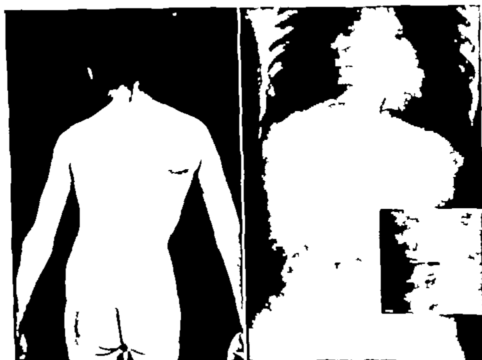


Fig. 90 (left) —Deformity of back. Note decompensated curve of scoliosis and muscular spasm.

Fig 91 (right) —X-ray of same patient. Note mild scoliosis with area of sclerosis in pedicle of 4th lumbar vertebra on left, surrounding a radiolucent area with central sclerosis. Inset close up of involved area.

(Courtesy of Sabanas, A. O., et al. Am. J Surg 91:880-889 June, 1956.)

William H Bickel and John H Moe[4] (Mayo Clinic and Found) found that osteoid osteoma in the spine is more common in the cervical and lumbar segments where the mobility of the spine in all planes is maximal than in the thoracic portion Localized pain at the site of the lesion is the most common first clinical sign A typical C shaped long scoliosis curve of mild or moderate degree with the apex

(4) Am. J Surg. 91:880-889 June, 1956.

at the level of the lesion is practically always present (Figs. 90 and 91)

Torticollis produced by lesions in the cervical spine corresponds to the scoliosis produced by lesions in the lower segments of the spine. Pronounced asymmetrical lordosis and stiffness of the spine are common findings Lesions in the spinous processes do not produce torticollis or scoliosis but do produce stiffness in the spine with inability to flex the neck or the lower portion of the spine according to the site of the lesion

Hypertrophic changes appear if the duration of the lesion exceeds two years Osteoid osteoma of the ribs or ilium produces a clinical picture similar to that of osteoid osteoma in the lumbar portion of the spine.

X ray diagnosis of osteoid osteoma is more difficult in the spine than in other bones partly because the x ray picture can be normal even after prolonged duration of clinical signs and symptoms

The diagnosis of idiopathic or congenital scoliosis should be carefully scrutinized in every case of scoliosis with a long C-shaped curve accompanied by spasm of spinal musculature, localized tenderness and lordosis Differential diagnosis should consider infection benign and malignant lesions protruded disk residual scoliosis after acute poliomyelitis as well as congenital or idiopathic scoliosis.

Surgery relieves the clinical symptoms

Incidence of Scoliosis in State of Delaware Study of 50 000 Minifilms of Chest Made during Survey for Tuberculosis is reported by A R. Shands Jr and Harry B Eisberg[5] (Alfred I duPont Inst) X rays were 70 mm in size. Evidence of scoliosis was found in 936 In recording the amount of curvature the Cobb technic was used to measure the angle of the curve No curvature with an angle of less than 10 degrees was recorded

Incidence was found to be 19/1 000 (1 9%) In the scoliotic group the ratio of men to women was about 1.3 The total number of moderate and severe curves in Negroes was 9% higher than the total number in whites The highest in

(5) J Bone & Joint Surg. 37 A 1243-1259 December 1955.

idence occurred among subjects aged 15 19 The convexity of the curve was to the right in 81%

An attempt was made to determine the etiology of the curvatures which appeared in the first 15 000 films examined i e. 230 cases About two thirds of the 230 cases appeared to be postural or functional and one fourth idiopathic in type. Because of many variables however the authors were not certain of many of these diagnoses

Ruptured Thoracic Disks may cause cord pressure with long tract signs or if more laterally placed root pressure with typical radicular signs and symptoms according to Norman H Horwitz Benjamin B Whitcomb and Francis G Reilly[6] (Hartford Conn) who operated on five patients aged 25-50 with typical ruptured thoracic intervertebral disks The myelogram was positive and the protein content of the cerebrospinal fluid elevated in all patients History of injury was definite in two and probable in one

Symptoms in patients with a picture of nerve root compression were similar in all being essentially pain over the distribution of the involved nerve root Although this pre senting symptom could be altered frequently by certain dynamics of the spine the association with dynamics is much less noticeable in the ruptured disk of the thoracic region than in those of the more mobile lumbar or cervical spine. Symptoms in two patients with long tract signs were more varied however both complained of paresthesia weakness and impotence. Physical signs were local tenderness and muscle spasm in three, pain on forward flexion in four pain on rotation and lateral flexion in one and Lhermitte's phenomenon in two

The only finding in routine x rays of the thoracic spine was thinning of the disk space in one and calcification within the disk in another The ruptured disks were at the 1st 2d thoracic in one, the 7th-8th in one the 9th-10th in two and the 11th 12th in one

Complete laminectomy was felt to be essential for centrally ruptured disks whereas hemilaminectomy usually was sufficient for disks laterally displaced The ruptured disk fragment was removed in all patients Pathologically

(6) Yale J Biol. & Med. 28.322 330 Dec. Feb., 1955-56.

all showed typical sequestra of fibrocartilage In four, t fragments had ruptured completely through the posteri longitudinal ligament and were lying free in the spi canal In one a large protrusion was covered by the p terior longitudinal ligament Pain was completely controll by surgery in all In one of two with long tract signs, t signs reverted to normal in the other they were much i proved although he still had some paresthesia in one l

Although ruptured thoracic disks are notoriously unco mon because of the relative immobility of this part of t spine due to support of the rib cage the authors believe t too frequently proper cognizance is not taken of pain in t thoracic root

Thoracic Injuries Analysis of 1,309 Cases seen dur 1947 54 was made by Richard L Rapport Robert B Al and George Curry[7] (Flint) There were 994 injuries to chest wall which included rib fractures subcutaneous e physema fractured sternum and flail chest Management fractured ribs should be directed toward prevention of co plications Immobilization of the chest by adhesive str ping is ineffective. Use of narcotics is to be condemn Therapy is aimed at increasing respiratory movement a promoting cough This is best attained by intercostal paravertebral nerve blocks and use of expectorants In s cutaneous emphysema specific treatment is unnecess since a patent airway is always present. Pain from a f chest will respond dramatically to intercostal nerve blo and paradoxical motion will improve following this pro dure Positioning with the involved side down adhes strapping or sandbagging may be used as emergency tre ment Sternal fractures if severe may lead to paradox motion Skeletal traction should be applied Most ster fractures however do not result in significant flail ch and should be treated by injection of 1% procaine into fracture site

Injuries to the pleura such as hemothorax, pneumothor pleurisy with effusion and chylothorax, were seen in 290 tients In hemothorax, early and complete aspiration of pleural space should be accomplished If hemorrhage is p

(7) J Michigan M Soc. 54 1321 1325 November 1955

gressive despite thoracentesis early thoracotomy with evacuation of clots and control of hemorrhage is indicated

Open wounds with chest wall defects (sucking wounds), leading to pneumothorax should be converted immediately into closed wounds by occlusive pressure dressings pneumothorax should then be treated appropriately In tension pneumothorax, air should be withdrawn by thoracentesis at once. Small uncomplicated closed pneumothoraxes, if the collapse is less than 20-25% require no specific treatment. If the collapse is more extensive complete early re-expansion of the lung is desirable for prevention of pleural effusion persistent bronchopleural fistula and empyema

Pulmonary injuries and complications seen in 344 patients consisted of pulmonary contusion laceration tracheobronchitis atelectasis pneumonia pulmonary edema and pulmonary abscess

Mediastinal injuries are relatively rare in injured persons who reach the hospital There were 20 instances of pneumomediastinum hemomediastinum cardiac injuries lacerations of the great vessels and traumatic asphyxia.

Certain abdominal injuries are so frequently related to thoracic trauma that they are considered complications rather than associated injuries These include injuries to the liver kidney spleen small intestine stomach and adrenal In the authors series 87 patients had abdominal injuries of this type included also were acute gastric dilatation ileus and lacerated diaphragm Acute gastric dilatation or ileus or both were present in 33 patients who had no intra abdominal injuries or fractures of spine or pelvis

In this series the mortality rate was 3%

Thoracic Pain of Musculoskeletal Origin is discussed by Mark B Coventry [8] Subcutaneous tenderness and pain may be due either to "tender fat which is probably a functional state, or may be caused by a form of collagen disease affecting the fibrous tissue which encapsulates the fat lobules The gelling' phenomenon subcutaneous nodularity and thickening and an elevated sedimentation rate may be present. Adiposis dolorosa (Dercum s disease) may be a form of this generalized rheumatic process

(8) Proc. Staff Meet. Mayo Clin. 31:6-9 Jan. 11 1956.

Involvement of the thoracic vertebrae may cause thoracic pain either by the spinal column itself with extension a short distance on either side or by irritation of the spinal nerves in this region Old epiphysitis should be suspected when pain in the posterior part of the thorax is complained of

Myeloma is probably the commonest tumor involving the thoracic vertebrae. In rheumatoid spondylitis the involvement of the chest wall is rather diffuse and the pain frequently extends far anteriorly Pyogenic osteomyelitis should be suspected when the pain is severe, well localized and accompanid by spasm and marked tenderness. The temperature is usually and the sedimentation rate invariably elevated There is often previous infection of the urinary tract. Most of the spinal pain seen in medical practice is due to degenerative disease

At times patients present the clinical picture of fractured ribs without a definite history of injury Cough or strain may produce such fractures The costochondral or Tietze's syndrome is characterized by painful swelling at the costochondral junction of the second or third ribs The condition is self limited and requires no special treatment. Post thoracotomy pain though usually self limited may persist for months

Possibly the commonest cause of pain in the chest wall is muscle fatigue and strain Rheumatic fibrositis, dermatomyositis and other collagen diseases are rare causes of pain of the chest wall

Periarthritis of the shoulder is prone to cause generalized thoracic pain and tender points are often found on the chest wall

Traumatic infectious and degenerative involvement of the sternoclavicular and acromioclavicular j[illegible] pains not only locally but referred to the mus[illegible] near the involved joints [illegible] involving th[illegible] up-per part of the humer[illegible] [illegible]le also may [illegible] in the chest wall

Clarification of [illegible] [illegible]d F[illegible] vulsive Therapy II R[illegible] Consid[illegible] sion x ray examination [illegible] spine i[illegible]

determine the presence of previous trauma and various other pathologic changes such as exaggerated kyphosis degenerative arthritis osteoporosis biconcave deformities due to pressure of large nuclei pulposi and the so-called Schmorl nodes (Fig 92) It is imperative also from the medicolegal standpoint as a means of providing a film for

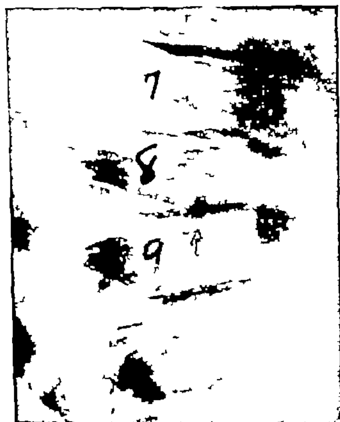


Fig 92.—Actual herniation of nuclei pulposi through end plates (Schmorl's nodes) These often calcify later (Courtesy of Newbury C. L., and Etter L. E. A.M.A. Arch. Neurol. & Psychiat. 74 479-487 November 1955)

comparison after convulsive therapy Constance L Newbury and Lewis E. Etter[9] (Univ of Pittsburgh) consider a vertebra to be compressed if it measures at least 2 mm less in anterior vertical height than on the control film Failure to make accurate comparative measurements may account for some of the wide variations in reported incidence of vertebral fractures in convulsive therapy

(9) A.M.A. Arch. Neurol. & Psychiat. 74 479-48 November 1955

Among 85 patients receiving electroconvulsive therapy, the authors found a 27% incidence of vertebral fractures, most commonly located in the middle third of the thoracic spine Age and sex did not seem to be significant factors. The presence or absence of subjective pain was not a reliable criterion for the diagnosis no pain was reported by 75% of the patients who had a fracture.

Referred Pain from Low Back Ligament Disability was studied by George Stuart Hackett[1] (Mercy Hosp Canton, O) Referred pain in the lower abdomen groin genitals, buttock and extremities to as far as the toes has been identified as having its origin in the ligaments that stabilize the lumbar and pelvic articulations Ligament relaxation is a chronic disability that results from strain, sprain and tearing of the ligament fibers when they do not regain their normal tension Pain associated with ligament relaxation is induced by stretching of ligament fibers under normal tension permitting abnormal stimulation of the sensory nerves within the ligament, which will not stretch The abundant supply of sensory nerves at the junction of ligament to bone has been established

Local and referred pain are identified by needling The point of a hypodermic needle is inserted within the fibrous strands of a specific ligament and a local anesthetic solution injected The irritation of the needle and pressure of the solution immediately reproduce local pain as in dentistry and frequently referred pain, which disappear within two minutes as anesthesia occurs

During treatment of 1 017 patients with ligament relaxation Hackett found that relaxed joint ligaments were the cause of more chronic low back disability than any other entity and of more referred pain into the lower extremities than all other causes combined

► [Before reviewing the work of Dr Hackett, I had used solutions of mild irritants to inject ligaments that were markedly relaxed to stir up a reaction of repair Dr Hackett has improved and popularized the technic of treating backache by injection of pontocaine® and sylnasol® into ligaments and muscles of the back. He has reported a high incidence of success in treating a large group of cases

Since meeting Dr Hackett and reviewing his book, I have treated a small series of patients in whom I could definitely detect palpable thicken-

(1) A.M A Arch Surg 73 878-883 November 1956.

ing and edema of the ligaments in the lower back. These have included sacro-iliac and iliolumbar ligaments, and the response to the injections has been most gratifying. The technic is not difficult to learn and all qualified physicians or surgeons should try it in carefully selected cases.—Ed.]

Late Laminectomy in Traumatic Paraplegia is reported by Lars Hagelstam[2] (Helsinki) in 48 patients. In 26 paraplegia was due to closed injuries and in 22 to open injuries received during war. Cervical injuries were present in 4, dorsal lesions in 8, thoracolumbar in 30 and cauda equina in 6. In 28, obvious compression of the cord or cauda equina could be relieved. In 15, results of the operation were favorable. In most patients improvement of function was small or insignificant, but in some it was notable and also influenced the psychic condition. The author concludes that laminectomy should be performed at a late stage if the operation has not been done earlier. As complete anatomic transection of the cord cannot be diagnosed clinically, all traumatic spinal cord lesions should be explored as soon as possible after injury.

Vertebra Plana and Histiocytoses: Report of Case with Involvement of Five Vertebrae. Eosinophilic granulomas are generally seen in children aged 5-12. Lack or paucity of signs and symptoms, absence of changes in the blood chemistry and tendency to recover regardless of type of treatment given are features of both Calvé's disease and eosinophilic granuloma. A case of the latter is reported by Lovick E. Dickey, Jr., R. J. W. Hobbs and John D. Sherrill, Sr.[3] (Med. College of Alabama).

Boy, 3, had pain in cervical region. The mother stated that he held the neck stiffly and resisted any effort to straighten it. Examination revealed considerable cervical muscle spasm, but the child held the head erect, resisting flexion and extension movements. X-rays of the cervical region showed fusion of the first three cervical bodies and congenital deformities of the other cervical segments. Four months later a limp of the left lower extremity with painful limitation of left hip motion was evident. X-rays showed collapse of the 8th, 10th, 11th and 12th thoracic vertebrae and the 2d lumbar vertebra (Fig. 93). The right ischium showed a 3 cm. area of destruction with further destruction in both femora. Microscopic examination of a specimen from the femur revealed a granulomatous lesion made up largely of histiocytes forming granuloma-like nodules. In some areas the histiocytes were fused into giant cells. A background of eosinophils

(2) Acta chir. scandinav. 110:218-226, 1955.
(3) J. Bone & Joint Surg. 37-A:1261-1265, December, 1955.

was noted throughout the tissue and also some increased fibrosis. Foam cells were rare. The picture was typical of the cholesterol histiocytosis. It showed features of Letterer Siwe disease, eosinophilic granuloma and Schuller-Christian disease. This is entirely in con-



Fig. 93.—Thoracic and lumbar portions of spine. Note collapse of bodies of 9th, 10th, 11th and 12th thoracic vertebrae and of 2d lumbar vertebra. (Courtesy of Dickey L. E., Jr., et al. J Bone & Joint Surg 37 A:1261 1265 December 1955.)

formity with the concept that all are variants of the same process. Later involvement of the mandible, skull humerus and rib was noted. X ray therapy was directed to these areas. Follow up x rays revealed considerable regeneration of the pelvic and hip areas and recalcification of the affected vertebrae. A year later he was asymptomatic and was living an active life

Postoperative Osteoperiostitis (Osteitis) Pubis was observed by E Wachs[4] (Univ of Leipzig) in two patients after prostatectomy

CASE 1—Three weeks after retropubic prostatectomy man 72, complained of pain that radiated from the os pubis into the left thigh, followed by swelling and inflammation. X ray showed indistinct contours and decalcification. The pain had disappeared when he was discharged, two months after operation. Three months later x ray showed complete healing

CASE 2—Man, 62 had an initially favorable postoperative course following a Millin prostatectomy Two months later the wound was reopened because of a large abscess in right pubic region. He had severe adductor spasms and uncontrollable pain X ray showed an area of inhomogeneous increased calcification and two round thickly calcified shadows suggesting phleboliths There was no definite evidence of active osteomyelitis. Bone destruction was clearly evident in later x rays. A paraurethral abscess was incised 4½ months after operation. Patient s recovery was slow but he was symptom free about a year after operation. Sudden acute symptoms with a high temperature, appeared 26 months after prostatectomy with severe pains in pubis and symphysis radiating down inner left thigh. X rays then showed many foci of healed osteomyelitis mainly in region of left hip socket, ischium and os pubis with leftward shift of hip socket. There were definite osteophytosis in both ischial processes and left of the greater trochanter synostosis and sclerosis of os pubis joint, and spotty atrophy in diseased bone with degenerative cysts. No active focus of osteomyelitis was visible. Death occurred in about three weeks.

Autopsy showed general sepsis soft tissue abscess ventral and caudal to symphysis with focal extension in adductors of left thigh, caudal involvement of upper two thirds of medial side dorsal almost to tuber ischiadicum and foramen obturatum. External bone structure of pars symphysis of pubic bone, especially on left, was destroyed. There was chronic osteomyelitis with fistulous tracts Vas deferens and epididymis showed chronic inflammation with scarring and there was also chronic trabecular cystitis with plum sized diverticulas, chronic ureteritis and pyelitis. Organisms causing osteomyelitis were coli Staphylococcus albus and hemolytic streptococci.

Undoubtedly both these patients had postoperative osteitis specifically periostitis pubis manifested radiologically by an inflammatory process in the cavum retzii especially in the paraprostatic region. The purulent process in pubis and ischium in case 2 led to complete destruction of left hip socket with shift in roof of socket was arrested but flared up again about 1½ years later and caused a severe purulent

(4) Radiol. clin. 25 152 163 May 1956.

soft tissue abscess in adductor region of left thigh, with generalized sepsis which led to death

Development of periostitis pubis depends on (1) primary infection of retropubic tissues during operation by infected urine or exogenous infection (2) secondary infection consequent to ineffective suture allowing leakage of infectious urine with extension of inflammation to perichondrium of symphysis and pubic periosteum and (3) trauma, especially during operation favoring nutritional disturbance of symphysis cartilage Infection can be continually transmitted or may spread via lymph channels

Pathogenesis of Osteitis Pubis is discussed by Howard L. Steinbach Nicholas L Petrakis Rutherford S Gilfillan and Donald R. Smith[5] (Univ of California) Osteitis pubis is a severely painful affliction of the pubis and adjacent musculature which often appears at various intervals after suprapubic and retropubic prostatectomies Cases have been reported following perineal and transurethral prostatectomies cystotomy ureterolithotomy pyelitis trauma and abdominoperineal resection for carcinoma of the rectum Usually the patient first complains of mild pain over the pubis and stiffness of the thighs 10 days to 6 months after surgery or the occurrence of other inciting incidents The pain and tenderness increase in severity and migrate to the ischial tuberosities

It has been claimed that trauma to the prostatic venous plexus and perhaps to the small vessel serving the pubis and ischia is an etiologic factor in osteitis pubis The prostatic plexus drains the many small veins emerging from the posterior aspect of the pubis and ischium Damage to the prostatic plexus producing obstruction would cause dilatation of the veins and hyperemia which could result in demineralization of bony structures To demonstrate this possibility the authors did osseous phlebography of the pubis on patients with osteitis pubis In one patient there was a complete obstruction of the venous drainage in the presence of normal arterial supply from the medial end of the pubis and ischium There was no filling of the pelvic venous plexuses indicating that they were completely occluded The

(5) J. Urol. 74 840-846, December 1955

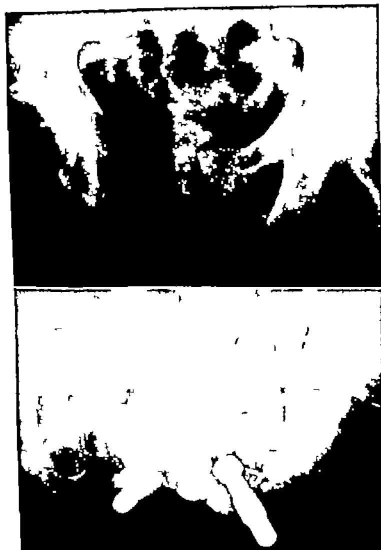


Fig. 94 (top).—Osteitis pubis following retropubic prostatectomy. X rays were made two months after surgery and one month after onset of pain. There is diffuse demineralization of medial aspect of superior ramus and entire inferior ramus of pubis, with some localized areas of erosion of cortex adjacent to symphysis and medial aspects of inferior rami.

Fig. 95 (bottom).—Osseous phlebogram of same patient, obtained 10 seconds after completion of injection of 10 cc. of 30% urokon.* Huge dilated, tortuous, venous channels are present, with distribution almost identical to osseous lesion. No drainage to pelvic venous plexuses or deep pelvic veins. Some vessels are within bone and others along its surface. Some dilated channels fit in thin cortical defects of inferior rami. A large vein appears to be causing erosion about symphysis pubis. Shadow at upper border of photograph is caused by barium in colon.

(Courtesy of Steinbach, H. L. et al: J. Urol. 74:840-846, December 1955.)

position of the characteristic cortical defects usually seen along the symphysis and medial aspects of the inferior rami of the pubis suggests that they are due to erosion by dilated venous channels situated between the cortex and periosteum (Figs 94 and 95) In another patient there was only partial obstruction to the venous flow with resulting venous stasis within the pubic bone

Osteitis Pubis, a condition of disputed etiology and pathology, is discussed by P Marioni[6] (Univ of British Columbia) who considers infection a dominant factor Osteitis pubis usually follows an operation on the urinary apparatus and the organisms involved are frequently gram negative. Symptoms and signs suggestive of infection are generally present and are usually proportional to severity of infection. X ray changes may not be evident at onset, but bony destruction followed by recalcification can be subsequently demonstrated Rarely osteitis pubis progresses to osteomyelitis a far more serious disease.

Treatment hinges on use of antibiotics to control infection neostigmine and atropine for muscle spasm and incision and drainage of localized infections There have been a few reports of beneficial results from deep roentgen therapy, and several physicians use ACTH and cortisone, with or without antibiotics reporting striking relief from pain and disability The author believes that the disease can often be prevented by more meticulous preoperative preparation of the skin in pelvic operations and sufficiently prolonged drainage of tissue in operations involving dissection of the pelvis

Nonsuppurative Osteitis Pubis in the Female was observed by Leon L. Wiltse and Charles H Frantz[7] (Grand Rapids Mich) in the anterior portion of the pelvic girdle of 13 women In five of them the symptoms were first noted during pregnancy in another five, within two months after delivery in one after extensive pelvic surgery and in two after an injury

Typically the patient (usually a young woman) begins to have pain about the symphysis within a few months after an event which produced trauma in the adjacent structures

(6) Canad. M A J 74 43 46 Jan 1 1956.
(7) J Bone & Joint Surg 38 A 500-516, June, 1956.

A physical examination reveals tenderness directly over the symphysis but no swelling or fluctuation Blood and urine are normal and fever is absent or low grade. Instability at the symphysis can often be demonstrated by x ray, and the opposing sides of this structure will slip up and down as much as ¼ in when the patient steps from one foot to the other Pain often becomes so severe that the patient is completely bedridden and can neither sit nor stand X rays taken at the onset usually show only negative results, but later

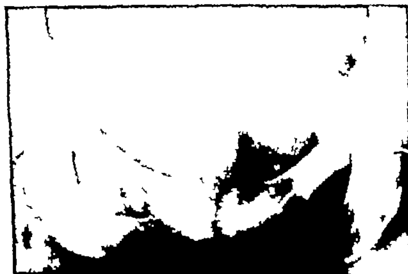


Fig. 96.—Anteroposterior view of pelvis, seven months after onset of symptoms. Note area of spotty destruction on opposing surfaces of symphysis and, beyond this, sclerosis of bone Diseased area extends about 2.5 cm. on either side of symphysis, which itself is definitely widened. (Courtesy of Wilkse, L. L., and Frantz, C. H. J Bone & Joint Surg 38-A 300-316, June, 1956.)

(Fig 96) they show spotty demineralization of the bone adjacent to the symphysis, widening of the symphysial gap and finally gradual development of sclerosis and narrowing These changes never extend more than a few centimeters laterally from the symphysis and are nearly always symmetrical The disease is self limited and gradual symptomatic recovery occurs taking from a few weeks to 3½ years Treatment should be symptomatic although x ray therapy cortisone ACTH and possibly phenylbutazone may be of value

Nonsuppurative osteitis pubis is a definite clinical entity related to but not identical with the condition ost seen so frequently in men

Luschka Joints of Cervical Spine are discussed by A G Boreadis and J Gershon-Cohen[8] (Albert Einstein Med.

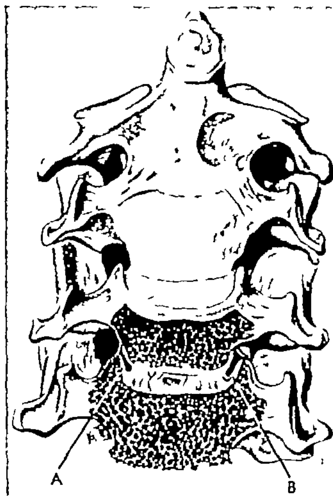


Fig 97 —Reproduction from Luschka's *Monograph*, showing joints (*A* and *B*) between posterolateral aspects of sectioned lower cervical vertebral bodies. (Courtesy of Boreadis, A G and Gershon-Cohen, J Radiology 66:181-184, February 1956.)

Center Philadelphia) Luschka joints are small synovial articulations 2×4 to 3×6 mm situated between the five lower cervical vertebral bodies They are located antero-

(8) Radiology 66 181-184, February 1956

medially to the mixed nerve root and posteromedially to the vertebral artery, vein and sympathetics as these pass through the vertebral foramen. They participate with the disk and vertebral body in formation of the anterior wall of the foramen (Fig. 97).

In the anteroposterior projection of the cervical spine, near the upper lateral margins of the lower five vertebral bodies may be seen on x-rays the upward spurlike projections which form the male element of the Luschka joint.



Fig. 98.—Vertebral bodies demonstrating male (A) and female (B) parts of Luschka joints in anteroposterior (1) and oblique (2) projections. Male and female parts of joints have been painted with opaque medium. (Courtesy of Boreadis, A. G., and Gershon-Cohen, J.: Radiology 66:181-186, February, 1956.)

The concave or female portion is easily observed on the corresponding undersurface near the lateral inferior margin of the vertebral body above. In a lateral view, the interspace of the Luschka joint is found occupying about one fourth of the posterior interspace between the cervical bodies. In oblique views, the margins of the joints are seen close to the lower anterior portion of the intervertebral foramen; when hypertrophic spurs form along these margins they protrude into the lower anterior segment of the foramen (Figs. 98 and 99).

As true synovial joints, the Luschka joints are subject to the diseases common to such joints. Their proximity to

Luschka Joints of Cervical Spine are discussed by A. G Boreadis and J Gershon Cohen[8] (Albert Einstein Med

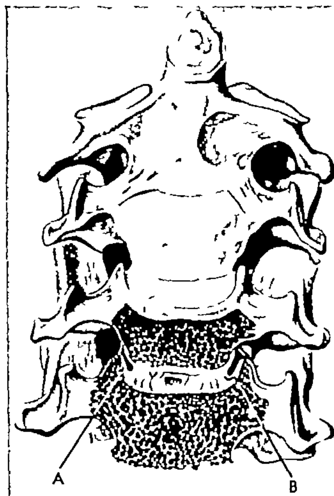


Fig. 97 —Reproduction from Luschka *Monograph* showing joints (*A* and *B*) between posterolateral aspects of sectioned lower cervical vertebral bodies. (Courtesy of Boreadis, A. G. and Gershon-Cohen, J : Radiology 66:181 186, February 1956.)

Center Philadelphia) Luschka joints are small synovial articulations 2×4 to 3×6 mm., situated between the five lower cervical vertebral bodies They are located antero-

(8) Radiology 66 181 186, February 1956.

medially to the mixed nerve root and posteromedially to the vertebral artery vein and sympathetics as these pass through the vertebral foramen They participate with the disk and vertebral body in formation of the anterior wall of the foramen (Fig 97)

In the anteroposterior projection of the cervical spine near the upper lateral margins of the lower five vertebral bodies may be seen on x rays the upward spurlike projections which form the male element of the Luschka joint



Fig. 96.—Vertebral bodies demonstrating male (*A*) and female (*B*) parts of Luschka joints in anteroposterior (*2*) and oblique (*1*) projections. Male and female parts of joints have been painted with opaque medium. (Courtesy of Boreadis, A. G., and Gershon-Cohen, J: Radiology 66 181 186, February 1956.)

The concave or female portion is easily observed on the corresponding undersurface near the lateral inferior margin of the vertebral body above *In a lateral view the* interspace of the Luschka joint is found occupying about one fourth of the posterior interspace between the cervical bodies In oblique views the margins of the joints are seen close to the lower anterior portion of the intervertebral foramen when hypertrophic spurs form along these margins they protrude into the lower anterior segment of the foramen (Figs 98 and 99)

As true synovial joints the Luschka joints are subject to the diseases common to such joints Their proximity to

nerve roots vessels ligaments and disks results in early manifestation of disease even when the synovial membrane only is involved without x ray evidence of bone or joint irregularities In later stages of arthritis, fibrous adhesions and demonstrable spurring may cause marked and unremitting

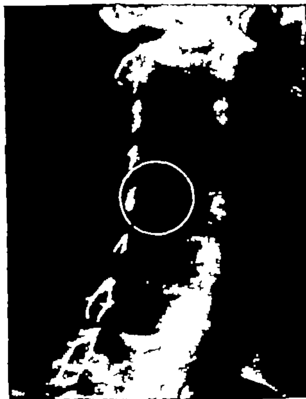


Fig. 99—Oblique view showing early hypertrophic spurring arising from Luschka joints between 4th and 5th cervical vertebral bodies. Spurring protrudes into adjacent foramen Not difference in Luschka joints above and below (Courtesy of Boreadis, A. G., and Gershon-Cohen, J Radiology 66 181 186, February 1956.)

symptomatology because of pressure on adjacent vascular and nerve structures Greater attention to radiologic changes in or about these joints might further elucidate the shoulder hand syndrome and hence aid in differential diagnosis of peritendinitis of the shoulder joint

► [The marked increase in incidence of neck, shoulder and arm pain, secondary to whiplash injuries of the neck, calls for a more careful study of the anatomy of the cervical spine. This excellent article emphasizes the importance of the rarely mentioned and unappreciated Luschka joints, which may be the locale of injury to ligaments and development of traumatic ar

thritis as a result of injuries such as those classified as sprains, without specific localization of the tissues which are sprained in a so-called whiplash injury.—Ed.]

Functional Roentgen Diagnosis of Cervical Spine in Practice is described by W Otto[9] (Univ of Leipzig) Among 50 control subjects aged 19 36 without clinical or roentgenologic changes in the cervical vertebrae, the smallest distance between the 2d and 7th cervical in dorsal flexion was



Fig. 100 (left) —Normal position.
Fig. 101 (right) —Normal bending.
(Courtesy of Otto, W Fortschr Geb. Röntgenstrahlen 83 834-839 December 1955)

2 5 cm while the difference on bending with separation of the dorsal processes was 10 cm maximum Normal vertebral interspace in a resting position averaged 6 5 cm

Interspinal distances can be calculated rapidly on a model with a line or compass Such investigation does not provide an absolute numerical value which differs individually according to length of cervical vertebrae but yields the relative variation of the distance from deflection to normal position to bending With normal cervical vertebral function interspinal distance in normal head position represents an average between the two movements (dorsal flexion and bending) Figures 100 and 101 show normal cervical verte-

(9) Fortschr Geb Röntgenstrahlen 83 834-839 December 1955

bral function in a girl 17 Interspinal distance from the 2d to the 7th cervical with maximal dorsal flexion normal position and bending is relatively 3.7-6.7-8.7 cm Youthful head position is somewhat similar to the stretching position normal has no midpoint but inclines somewhat toward that of bending

Functional roentgenograms in 60 patients with symptoms referable to the cervical vertebrae showed great variation in movement With increasing age there is reduced move-



Fig. 102 (left).—Normal position.
Fig. 103 (right).—Bending.
(Courtesy of Otto, W Fortschr Geb. Röntgenstrahlen 83:834-839 December 1955)

ment measurable as a diminution of interspinal distances Disturbances in range of movement consequent to axial or vertebral displacement as well as solidification result according to degree in a deviation of intervertebral relations Figures 102 and 103 show pathologic function of the cervical spine in a woman 59 who complained of shoulder and arm pains and had intervertebral osteochondrosis between the 5th and 7th cervical Functional films showed the relation 6.2-6.9-10.5 cm indicating severe disturbance in normal range of movement especially with bending In relation to the stretching position normal position was similar to that of bending

This simple technic of determining interspinal space during different head positions deserves clinical trial Most important information regarding motor function is shown during maximal head bending even with the slightest disk atrophy an axis deviation with definite slipping of the vertebrae is shown Interspinal distances between individual vertebrae reflects the elasticity and accommodation of intervertebral disks and therefore their functional fitness Functional impairment in stretching ability can be judged to a certain extent from the flexion film Functional studies of the cervical spine should result in earlier diagnosis of pathologic changes Careful correction would reduce the incidence of severe degenerative lesions

Whiplash Injuries are produced by violent extension and flexion of the spine. They usually happen when the automobile in which the patient is sitting at rest, stops and is hit from behind with force or when a vehicle stops suddenly and the patient is thrown forward. In these cases the forces which cause the injury are hyperextension then an overcorrected whiplash hyperflexion Other causes are a violent slap on the back clipping and body blocking in football and falling down steps or escalators although the commonest cause is collision from behind. Most symptoms stem from injuries in and around the 3d to 5th cervical and 4th to 5th lumbar vertebrae.

E G Lipow[1] (Washington D C) reports 50 cases of whiplash injury In his patients associated previously existing conditions in the neck or back were minor or com pletely absent they had no history of any similar injury of this type before the one reported and they presented no x ray abnormalities other than straightening of the cervical curve

Pathologic conditions following the injury consist essentially of disruption of the normal anatomy by avulsion fracture hemorrhage laceration and encroachment on the normal structures Hemorrhage can occur in the soft tissues of the neck and around the nerve trunks

Soon after the accident the patient complains of pain and stiffness of the neck with a more or less constant occipital

(1) South. M. J 48 1304 1311 December 1955

headache which may radiate toward the frontal region and around the eye. Pain in the back of the neck becomes more intense and spreads down the lateral aspect of the neck to one or both shoulders Rotation of the head and flexion of the neck and head become limited because of pain and spasm As the condition progresses the headaches continue and the patient becomes apprehensive and even psychoneurotic.

In treatment elimination of spasm of the neck and shoulder muscles is imperative Heat used in its various modalities is helpful This is followed in most cases by cervical traction Muscle relaxants of the mephenesin group are well tolerated and were used in each of Lipow's patients The sooner treatment was started the sooner the patient improved In this series 84% of the patients started treatment within 24 hours and about 88% were cured or improved after a period of management

Minor Trauma and Algias of the Cervical Spine. Pierre Pizon[2] (Paris) points out that even slight trauma to the cervical spine may produce changes affecting not only the osteoarticular structures but the blood vessels especially the vertebral artery and the elements of the nervous system i e the vertebral nerve of Franck, roots of the mixed cervical nerves spinal cord meninges of cord and roots and finally the accompanying sympathetic components The vertebral artery and the other vessels are exposed to stretching and contusion as a result of abrupt movements whatever their direction The spinal cord is more or less fixed longitudinally thus making it vulnerable to large movements of the spinal column Hyperflexion does not compress the cord unless it is pronounced enough to cause interapophysial luxation but hyperextension readily leads to meningeal and vascular trauma. Finally diffusion of the sympathetic system is so extensive that the syndromes produced by irritation of the sympathetic fibers of the vertebral nerves are extraordinarily varied In addition to the irritative syndromes injury to the cervical spine may be responsible for other post traumatic conditions such as cervicobrachial neuralgia radiculitis and various lesions of the medulla and the meninges.

(2) Presse méd. 64 960-963 May 23 1956.

The anatomic signs of irritation eventually leading to the degeneration found in association with the medullary or meningeal lesions have caused these lesions to be ascribed to compression either immediate or slight but prolonged or to ischemia, either direct as a result of contusion or indirect (reflex) These mechanisms are closely related. The various theories advanced to explain the myelopathies reticulopathies and sympathetic algias associated with cervical trauma however contain so many inadequacies that it is more than likely that reflex ischemia is the principal factor in production of these conditions Reflex ischemia would account for the disproportion between the slight osteoarticular lesion and the serious neurologic consequences It would also explain why simple laminectomy with its decompressive and neurovegetative effects is beneficial but only partly so while the nerve lesion itself is only moderately improved if the condition has lasted too long

Roentgen therapy is the treatment of choice Traction and manipulation are contraindicated because they violate the basic principle of rest for an injured joint. The accidents and complications accompanying use of such procedures prove the seriousness of the neurologic risks to which they expose the patient

Pain in Neck and Shoulder Common Causes and Response to Therapy Edward M Krusen[3] (Baylor Univ) studied 800 patients with this syndrome more than half were aged 30-50 60% were females

Treatment for cervical syndrome in general consisted of application of heat usually short wave or microwave diathermy for 30 minutes deep stroking and kneading massage and if tolerated, frictional massage Except in acute cases this was followed by vertical traction in a Sayre head sling according to the method of Hanflig which combines traction for one to three minutes with gentle manual rotation starting with approximately 30 lb and gradually increasing the amount. All patients were given supervised active neck exercises Particular stress was placed on rotation and lateral bending with avoidance of extension. In addition some patients received stimulation by a tetanizing current from a

(3) J.A.M.A. 159 1282 1285 Nov 26, 1955

low voltage stimulator in an effort to relax the tense neck muscles

Patients were first divided into those with relatable injury and those without injury In assessing improvement in relation to type of involvement acute fibrositis was found to be a separate and distinct category more than 90% of patients in this group showed good improvement and 7% moderate improvement with an average of 7 7 treatments Results in the injury and noninjury groups were similar with about 40% and 42% of patients making good improvement and 47% and 39% moderate improvement respectively Average treatment time for the injury group was four to five weeks and for the noninjury group three to four weeks Length of time from onset of complaints until start of treatment had a minimal effect on degree of improvement The effect of duration of treatment on degree of improvement was also insignificant No optimal treatment time could be determined

► [The suggestions of Krusen for treatment of the symptom complex of pain in the neck, shoulder and arm should be of help to all who are called on to treat this distressing syndrome.—Ed.]

The Painful Shoulder Jack W Newport, Rufus H Alldredge and Daniel C Riordan[4] (New Orleans) studied the case histories of 136 patients with painful shoulder In half the cases x rays revealed calcific deposits in the region of the greater tuberosity indicating calcific tendinitis Subacromial bursitis was diagnosed in 28 and frozen shoulder in 13 The pain was referred to the shoulder and was due to osteoarthritic changes of the cervical spine in 13 patients. Other causes for shoulder pain include tears of the rotator cuff bicipital tenosynovitis fibrositis and myositis old fracture deformities acromioclavicular arthritis and neoplasms Referred pain from visceral organs must always be considered in differential diagnosis

Calcific tendinitis is a degenerative process due to the wear and tear of everyday living The calcium deposits most commonly occur in the supraspinatus tendon The deposits may disappear either with or without treatment and may also reappear in the same place or in another part of the tendinous cuff

(4) J Louisiana M. Soc 108:20-27 January 1956.

Differential diagnosis should consider fibrositis and myositis cervical rib and the scalenus anticus syndrome, non specific brachial plexus neuritis old acromioclavicular dislocations and primary or metastatic tumors to the shoulder or cervical region

Most patients with calcific tendinitis were treated with injections of local anesthetic solution combined with diathermy and exercises The addition of hydrocortone* injected into the area improved results

Once the shoulder becomes stiff and painful the only way to regain motion is to use the joint Heat diathermy and massage combined with active and passive exercises will often be all that is necessary If all other methods have failed manipulation may be used in chronic cases

Painful Shoulder Syndrome Following Cardiac Surgery was observed by Edward J Lorenze[5] (White Plains N Y) in 6 of 57 patients The prolonged period between surgery and the time patients were seen (three months to one year) indicated that the condition is not self limiting and requires specific treatment. Signs and symptoms all occurred in the left shoulder While there was much muscle tenderness on palpation no true trigger points with referred pain were noted. All patients with the condition were over 40 but only one had pre-existing disease of the shoulder area (cervical rib and cervical osteoarthritis) and in no instance were symptoms referable to the shoulder present before surgery The operative procedure was clearly the instigating factor but no mechanism of production could be singled out. None of the patients had had "post-commissurotomy syndrome and no relationship could be established All manifested significant anxiety reactions which may have contributed to muscle guarding and heightened awareness of postoperative pain

The clinical picture may be primarily involvement of the long adductors with fibromyositis and shortening involvement of the rotator cuff mechanism shoulder hand syndrome or a combination of these The initial mechanism of voluntary or involuntary guarding because of pain undoubtedly led to shortening of the long adductors or the short

(5) Arch. Phys. Med. 37:555-559 September 1956.

rotators or both Lack of movement and the dependent position of the arm interfere with venous return and lead to edema of the shoulder and at times the hand This leads in turn to periarticular adhesions which further limit movement This course of events can occur solely from immobility and dependency though reflex sympathetic dystrophy can also play a part being initiated either from an area of inflammation of the skeletal muscle or from the surgically traumatized pericardium or myocardium It is not felt that this constitutes an entirely new mechanism of production of painful shoulder but rather a new initiating factor which triggers many well known mechanisms

Incidence of Hypersensitive Areas in Posterior Shoulder Muscles Survey of 200 Young Adults The myofascitic syndrome may include pain stiffness limitation of motion tremors weakness and other manifestations of autonomic nervous system dysfunction These changes may be present as alterations of the sweat pattern paresthesias and local changes in skin temperature, but the patient s chief complaint is usually pain In patients with this syndrome small abnormally sensitive areas of tenderness in muscle or other connective tissue have been observed which on pressure or other local stimulation appear to trigger off" the myofascial pain syndrome. For this reason they have been designated trigger points " The pain pattern arising from stimulation of a trigger point may be relatively local in distribution or may radiate or be referred to a site at considerable distance from the point of stimulation.

Andres E Sola, Miriam L Rodenberger and Betty Gettys[6] studied the possible existence of latent trigger points in 200 asymptomatic persons (100 men and 100 women) in whom on being subjected to strain chronic fatigue chilling or other irritating stimuli they might serve as the source of clinical symptoms The authors found trigger points in 54% of the female and 45% of the male subjects Radiating or referred pain could be demonstrated in 12 5% of all subjects. Trigger points tended to occur in multiple, rather than isolated, phenomena affecting a single muscle. More than one trigger point was found in 62 5% of the group Of the trig

(6) Am. J Phy Med 34 585 590 December 1955

ger points noted (253) 84.7% occurred in four muscles—trapezius levator scapula infraspinatus and scalenus with frequencies in that order A comparison with a previous clinical study of shoulder lesions indicated that there is a definite correlation between asymptomatic hypersensitive areas and clinical myofascitis

Management of "Frozen Shoulder Immobility of the articulatio humeri sets in most commonly in middle life Cause and exact nature are unknown G Edmund Haggart Robert J Dignam and Thomas S Sullivan[7] (Lahey Clinic) treated 96 patients by hospitalization closely supervised therapeutic exercise and manipulation of the joint at several sessions with the patient under general anesthesia. Complete mobilization must not be expected at the first session but is achieved in stages The exercise program continues during the intervals of three to five days between manipulations Results were excellent or good in 82% subjectively and in 95% objectively

After the patients regained a full range of motion—an average of three to four months after manipulation—no recurrences were noted even though most patients had discontinued the exercises at the end of that period Neither at discharge nor at follow up examination was any clinical evidence of pathology or sign of tenderness noted along the bicipital tendon or groove. There were no complications such as fracture of the humerus in this series

Surgical Treatment of Recurrent Dislocation of Shoulder Joint is reported by A Starzyk and V Mandic[8] (Univ of Zagreb) in 41 patients observed from 1947 to 1954 In 21 the dislocations were contracted during athletics and in 5 were due to trauma There were 30 men Most dislocations occurred in the third decade Surgery was done in 15 The Putti Platt technic was used in 10 the Bankart method in 1 and the Eden Hybinette method in 4 No recurrence was noted and all patients remained free from pain though those operated on by the Putti Platt and Bankart methods showed limitation of external rotation Follow up was from two to seven years. As four patients treated by the Eden Hybinette

(7) J.A.M.A 161:1219-1222, July 28, 1956.
(8) Acta chir jugoslav 2 40-50 1955

method with follow up of two to three years regained full and free movements of the extremity the authors consider this procedure the method of choice This technic consists of removal of a small bone graft from the tibia which is then affixed anteriorly to the neck of the scapula in front of the capsule. In this way the graft prevents the head of the humerus from sliding forward (Fig 104)

Between 1930 and 1945 15 patients were treated with the Oudart and 5 with the Putti Platt methods follow up stud

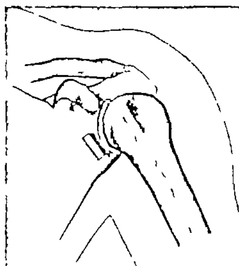


Fig. 104—Principle of Eden Hybinette. Note position of graft. (Courtesy of Starzyk, A., and Mandic, V Acta chir jugoslav 2 40 50 1955)

ies were available in only 9 No recurrence was noted and movements of the extremity were good.

Early reduction and an adequate period of immobilization are most important in prevention of recurrences In the present series immobilization did not exceed 15 days in 5 patients and was not done in the other 36

Recurrent Dislocation of Shoulder A 24 Year Study of Johannesburg Stapling Operation G T du Toit and D Roux[9] (Witwatersrand Univ) reviewed 150 cases of recurrent dislocation of the shoulder treated by repair of the demonstrable lesion In each the detached labrum or the torn capsule was pinned to the rim of the glenoid cavity with

(9) J Bone & Joint Surg 38 A 1 12, January 1956.

staples and as far as possible nothing else was done at operation to alter the mechanics of the shoulder

In 99% of the patients a clearcut easily recognizable Bankart lesion was present In 11% of these the bucket-handled labrum was excised in the same manner as a torn meniscus in the knee in 21% there was a well marked bare area on the anteroinferior aspect of the neck of the scapula just medial to the glenoid margin in 10% bony damage to the glenoid margin existed

TECHNIC.—Through the deltopectoral approach the cephalic vein is retracted laterally the coracobrachialis and the biceps are retracted medially and the humerus is rotated externally This exposes a considerable part of the subscapularis The subscapularis is split from its bony insertion medially for a distance of 3 in. This split is deepened with a blunt instrument, and two retractors are inserted to expose the capsule of the joint, which is opened along the same line as was the subscapularis. Thus exposes the head of the humerus cleft of the joint, anterior margin of the glenoid and lesion of the labrum

The joint is easily inspected through the incision. The capsular margins with the synovial membrane are retracted with vulsellum forceps and a Bankart skid is inserted into the joint. The concave surface should rest on the head of the humerus and the serrated toe be thrust through the joint cavity so that it catches or impinges on the posterior margin of the glenoid, thus acting as a fulcrum for levering the head of the humerus backward. When the skid is in place, the whole glenoid surface including the tear of the labrum, can be readily demonstrated. The best position for the staples can then be easily determined.

It is customary to use two staples. A self locking staple holder is the most efficient means of insertion. If the labrum is bucket handled, it is excised and the free margin of the capsule firmly stapled to the margin of the bony glenoid. If the labrum is only detached, the staple is inserted just medial to the margin of the glenoid, transfixing the labrum and sometimes a fold of the capsule. It is driven deeply into the hard bone of the neck of the glenoid so that it does not penetrate the articular surface but its points are about 1/3 in. beneath the cartilage.

When the retractors and the Bankart skid have been removed, the edges of the capsule and of the split in the muscle fall together The joint capsule is closed by continuous suture, but the muscles do not require repair The wound is closed in layers.

Results were satisfactory in all but seven patients No serious complications arose from use of the staples The average period of absence from work was 43 days However

the most recently treated patients were absent usually for not more than two weeks

► [The Bankart lesion is based on an erroneous conception of the pathology of recurrent dislocations of the shoulder In most anteroinferior dislocations of the shoulder there is little, if any actual detachment of the capsule from the margin of the glenoid. The femoral head displaces through the opening which connects the subscapularis bursa with the shoulder joint. *This bursal opening may be congenitally larger than average*, thus making dislocations into the bursa relatively easy Each time the head displaces, the bursal opening may be enlarged. In the Bankart operation the opening to the bursa is closed by suturing or according to the technic of du Toit and Roux, by stapling the capsular tissues to the margin of the acetabulum. The Magnuson operation creates an equally effective support to the shoulder by transferring the tendon of the subscapular muscle to a more lateral position. This forms a powerful muscular sling beneath the head of the humerus *without obliterating a physiologic structure* which may be of some importance. A combination of the Nicola and Magnuson operations has thus far in our hands, been 100% successful in preventing recurrent dislocations.—Ed.]

Repair of Dislocated Shoulder Using Modified Magnuson Technic is presented by Robert W Augustine[1] (Maxwell Air Force Base Alabama)

Technic.—A 2 in. incision, between the chest and the shoulder is made between the deltoid and pectoralis muscles beginning 1 in. below the tip of the coracoid and extending toward the deltoid tubercle. This technic exposes the fascia covering the anterior shoulder and permits taking the cephalic vein to the external side for ligation if it is damaged. The bicipital groove and the two tuberosities of the humerus will be evident. The fascia and ligamentous tissue are taken off the bone of the lesser tuberosity by sharp dissection beginning medial to the biceps tendon, and the joint is entered The opening is extended proximally along the inferior border of the coracohumeral ligament medial to the biceps tendon and toward the coracoid, and inferiorly along the neck of the humerus adhering to the bony surface until the fascia, so released, will mobilize and deliver external to the biceps tendon. This ligamentous tissue includes the subscapularis tendon, which is never individually dissected, the anterohumeral joint capsule synovia and contiguous fascia of anterior shoulder joint structures An area for attachment of this mobilized tissue is cleared on the greater tuberosity about ¾ × ½ in by stripping the soft tissue and etching the bone but not removing the cortex. The mobilized tendon is advanced external to the bicipital groove to the prepared bed and slightly distal to its previous level and is harpooned in this moderately taut position with an ice pick. Two 1¼ in. serrated boat nails are driven through the mobilized fascia into bone, accomplishing fixation. The boat nails are driven through representative portions of the fascia at an oblique angle and into the bulk of the humeral head. The arm is tested for mobility the

(1) Am. J Surg 91 736-741 May 1956.

field left dry and the wound closed with subcutaneous and skin sutures.

Complicating hematomas occurred in 8% No contracted shoulders or redislocations developed in a series of 59 operations

► [Eleven years ago I performed my first Magnuson type of operation for recurrent dislocation of the shoulder In that instance I combined with the Magnuson operation the transplantation of the long head of the biceps muscle as described by Nicola. Since then, I have treated each case of recurrent dislocation of the shoulder by this combined procedure. A small staple has been used to attach the subscapularis tendon to the humerus. Augustine has shown that a boat nail will hold the transplanted tendon equally securely My series is small, but during the 11 years there have been no redislocations in any of the cases that I have operated on by this technic.—Ed.]

Prognosis in Dislocations of Shoulder Carter Redd Rowe[2] (Massachusetts Gen l Hosp) reviewed 500 shoulders in 488 patients with follow up on 313 shoulders (63%) mean follow up being 4.8 years Primary shoulder dislocations occurred as often after age 45 as before Posterior dislocation occurred in 2% bilateral dislocation in 2 4%

Dislocation recurred in 38% of the patients Following primary or initial dislocation 70% of the recurrences appeared within two years Incidence of recurrence was high in the second decade (92%) but showed marked decrease after age 50 (12%) Average age of patients without redislocation was greater than that of those with dislocation. Usually the greater the initial injury the lower the incidence of recurrence Incidence of recurrence seemed to be affected little by type and length of immobilization of the shoulder after dislocation Though high incidence of recurrence was noted in the group of patients who had had no or short periods of immobilization long periods of immobilization were not associated with significant decrease in recurrence.

Fracture of the shoulder girdle was a complication in 24% Incidence of fracture of the greater tuberosity was 15% this complication was accompanied by appreciable lowering of incidence of recurrence (7%) The exception was in chip fractures of the anterior glenoid rim Humeral head defects were present in 38% of primary and 57% of recurrent dislocations these were associated with increase in incidence of recurrence (82%)

( ) J Bone & Joint Surg. 38 A 957-977 October 1956.

Incidence of associated nerve injury was 5.4%.

The Bankart procedure or some modification of it, was commonly used in surgical repair. Among 75 of these procedures only one dislocation recurred.

► [The high incidence of recurrence of dislocations in this series is surprising. The Bankart procedure is based on a false premise. It is more difficult to perform than is the Magnuson operation. When the insertion of the subscapularis tendon is shifted laterally and downward on the shaft of the humerus, the end results are at least as satisfactory as those of the Bankart or Putti-Platt procedures.—Ed.]

Arthro-onychodysplasia Hereditary Syndrome is reported by Harold Broder[3] (U. S. Air Force Hosp., Parks Air Force

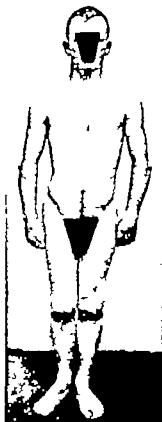


Fig. 105.—Note knobby knees, external rotation of legs and posterior prominence of radial heads. (Courtesy of Broder, H.: U. S. Armed Forces M. J. 7:226-231, February, 1956.)

Base, Calif.) The syndrome consists of bilateral posterior dislocation of the radial head, hypoplasia and lateral dislocation of the patellae, dystrophy of the nails and a horizontal sacrum.

(3) U. S. Armed Forces M. J. 7:226-231, February, 1956.



Fig 106 (top) — Anteroposterior view of knees, note hypoplasia and lateral position of patellae and external rotation of tibia and fibula.
Fig 107 (bottom) — Lateral view of elbows, showing position of radial heads. (Courtesy of Broder H U S Armed Forces M J 7:226-231 February 1956)

CASE 1 — Boy 17 complained of pain and swelling in knees after marching and prolonged standing. The symptoms had been noted after excessive activity for many years. Physical and x ray examinations revealed the following (1) knees—knobby (Fig 105) small patellae articulating with lateral aspect of lateral femoral condyle shallow articular groove on lateral femoral condyle for patella (Fig 106) downward and oblique lateral pull of quadriceps tendon shal

low empty palpable intercondylar notch of femur prominent medial femoral condyle prominent tibial tubercle with lateral displacement active motion 160-45 degrees passive motion, 185-45 degrees no ligamentous instability (2) elbows—radial head prominent posteriorly at level of upper end of olecranon atrophy of capitellum (Fig 107) limitation of terminal 15 degrees of extension, pronation and supination (3) nails—absence of both thumb nails grayish discoloration and longitudinal ridging of other nails of hands and feet (4) back—severe lumbar lordosis horizontal sacrum (5) legs and feet—external rotation deformity of leg 45 degrees secondary varus of feet.

Case 2.—Man, 21 brother of Case 1 had similar defects of right elbow knees nails and spine. Complaints again were limited to knees.

Maternal grandfather and mother were similarly affected.

Compression Neuropathy of the Median Nerve is discussed by G Erick Bell Jr and J Leonard Goldner[4] (Duke Univ) The pathologic changes which take place in this condition are usually of the first degree there is no loss of continuity or degeneration of nerve fibers other than localized vacuolization of the myelin Local edema and cellular infiltration may be present Proprioceptive and motor functions are more vulnerable in first degree injury than are the functions of pain touch and sympathetic activity The mechanism is thought to be due to ischemia and/or axonal injury from external pressure. The nerve changes are readily reversible If the mechanism causing the alterations is unrelieved second degree nerve damage may occur The axonal injury will then progress leading to Wallerian degeneration distally as well as changes for a short distance proximally Thus with prolonged moderate nerve compression recovery will be slow and in some instances incomplete even after relief of the compression

Although compression of the median nerve may occur at any point in its course the sites of predilection are carpal tunnel forearm hand and just above the elbow The syndrome is frequently labeled spontaneous but in the 27 patients reported a specific cause was found in over 50% and a probable cause in about 25%

Some of the problems involved are illustrated by the following case

Man 45 gave a history of several years progressive weakness of

(4) South. M. J 49:966-972, September 1956.

the thumb and index finger and atrophy of the thenar eminence. No sensory change had occurred. Direct pressure in the palm just to the radial side of the hypothenar muscles in line with the ring finger caused pain. There was no pain over the course of the median nerve. A pea sized tender mass was palpable 2 cm. distal to the carpal crease. Exploration of the hand revealed a lobular thrombosed aneurysm of the ulnar artery which had been causing intermittent com



Fig 108 —Long-standing thrombosis of ulnar artery Motor branch of median nerve is opposite artery When hand was cupped and squeezed, firm thrombus compressed small motor branch of nerve and resulted in paralysis of intrinsic muscles of thumb. No sensory deficit was present. (Courtesy of Bell, G. E., Jr., and Goldner J L: South. M. J 49:966-972, September 1956.)

pression of the recurrent motor branch of the median nerve (Fig 108)

Recurrent Ulnar-Nerve Dislocation at the Elbow Harold M Childress[5] (Jamestown N Y) studied 2 000 supposedly normal elbows and found recurrent dislocation of the ulnar nerve in 16.2% of the subjects (slightly more often in women than in men) The probable cause of the dislocation is congenital laxity of supporting ligaments Such nerves usually remain asymptomatic unless subjected to trauma, when friction neuritis may develop

The hypermobility of the ulnar nerve may be classified into type A in which the nerve moves out of its postcondylar

(5) J Bone & Joint Surg. 38-A:978-984 October 1956.

groove onto the tip of the humeral epicondyle when the elbow is completely flexed and type B in which the nerve has greater excursion than in type A and passes completely across and anterior to the epicondyle when the elbow is flexed to more than 90 degrees Observation of 34 subjects with ulnar neuritis due to dislocation indicated that type A ulnar nerves are subject to direct trauma, where type B ulnar nerves are more vulnerable to friction irritation

Industrial workers are more often affected than other persons However they usually sustain injuries at the side *of the hand not of the elbow*

Surgery is indicated for patients with definite friction neuritis with progressive sensory and motor loss In anterior transplantation deep *intramuscular placement of the* nerve is superior to the subcutaneous method

Restoration of Lost Rotation of Forearm and Hand by Intentional Permanent Defect in Lower Ulna consequent to

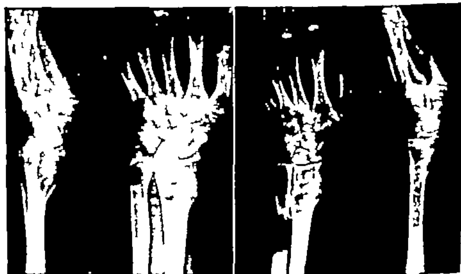


Fig 109 (left) —On hospitalization, four months after fracture, rotation was impossible.
Fig. 110 (right) —After extraperiosteal excision of ulna.
(Courtesy of Ingebrigtsen, R. Acta orthop. scandinav 25 105-113 1955)

fracture of the radius or forearm in the lower half can easily be obtained by extraperiosteal excision of *3-4 cm of the* ulna above the pronator quadratus muscle according to R. Ingebrigtsen[6] (University Hosp Oslo) The position and

(6) Acta orthop scandinav 25 105-113 1955

stability of the hand are not disturbed by the permanent defect in the ulna. The five patients reported on had lost more or less completely rotation of the forearm and hand after a fracture of the radius or forearm above the wrist. Rotation was restored by extraperiosteal excision of a few centimeters of the ulna above the pronator quadratus muscle (Figs 109 and 110) The results suggest that the lower part of the ulna is of only insignificant importance in stability and function of the forearm and hand and that the radius is more important distally the ulna proximally

► [Loss of rotation of the forearm as a result of fracture in the region of the wrist, such as a Colles fracture which has healed in malposition, is usually associated with shortening of the radius. Resection of the distal 3 cm. of the ulna will restore rotation, permit more normal wrist motion and remove factors of irritation which are sometimes painful because of impingement of the distal end of the ulna upon the proximal row of the carpal bones and also because of disruption of the radial-ulnar joint. This is a procedure which we have preferred to that of resection of a segment of ulna proximal to the radial ulnar joint.—Ed.]

Etiology and Prevention of Volkmann's Ischemic Contracture Paul R. Lipscomb[7] (Mayo Clinic and Found.) evaluated the records of 92 patients The contractures followed supracondylar fractures of the upper extremity in 44 patients and fractures of both bones of the forearm in 18. In the light of present knowledge, 61 of the contractures probably were preventable

Review of these 92 patients and previous experience with another group of 10 seen 1 72 hours after injury and on whom arteriectomy was performed because of irreparable arterial damage and (in some) impending Volkmann's contracture suggest that arterial injury with vascular spasm is the most important cause of this contracture In the upper extremity major arterial obstruction is not so important in producing it as is the associated spasm of the collateral blood vessels The importance of the collateral circulation is illustrated by Figure 111

In Volkmann's contracture there is an early stage consisting mainly of tonic contracture which in certain instances can be helped by early operative intervention and a late stage with an anatomically irreversible fibrosis The anatomic structure of the median and ulnar nerves makes

(7) Surg., Gynec. & Obst. 103:353 361 September 1956.

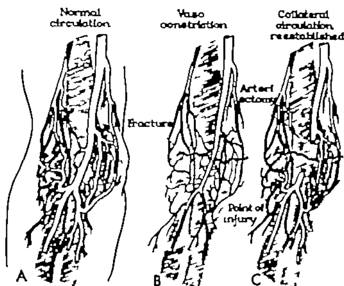
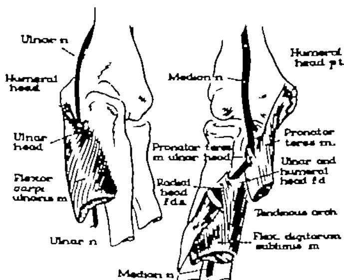


Fig 111 —Arterial circulation around elbow *A* rich collateral network is formed by brachial, profunda, radial and ulnar arteries, with their recurrent branches. *B* Injury to brachial artery may produce spasm f injured artery and collateral vessels. *C* spasm in distal and collateral arteries is released when damaged segment of artery is excised. (Courtesy of Lipscomb, P R. Surg Gynec. & Obst. 103:353-361, September 1956.)



F g 112 —Ulnar and median nerves upper forearm. Tonic spasm and fibrous contracture f flexor carpi lnaris may strangulate ulnar nerve as it passes between the tw heads f this muscle Median nerve may be strangulated as it passes between the tw heads f prona or teres and under tendinous rch of flexor digitorum sublimis. (Courtesy f Lipscomb P R. Surg Gynec. & Obst. 103 353-361 September 1956.)

them particularly susceptible to injury from this tonic contracture and fibrosis (Fig 112)

Early treatment of acute vascular spasm is necessary even though it means surgical exploration of the antecubital fossa and forearm and resection of the injured or thrombotic segment of the brachial radial or ulnar artery In open or other fractures and severe crushing and contusing injuries of the forearm accompanied by severe edema attempts should not be made to close the wound primarily instead, extension of the original wounds and use of relaxing incisions are often indicated Adequate and early treatment of acute vascular injuries usually insures a good prognosis delay may lead to serious and permanent disability

---

THE HAND AND WRIST

Adduction Contracture of the Thumb presents a most serious disability of the hand The thumb is useless as an opponent for the fingers it is unable to abduct and rotate and in some cases flexion of the fingers is blocked The hand is incapable of proper grasp pinch and stereognosis The mechanics controlling the position of the thumb are crippled. The commonest causes of adduction contracture are burns trauma infection ischemia, paralysis spastic conditions and improper splinting

J Edward Flynn[8] (Tufts College) recommends starting therapy soon after the accident with methods designed to prevent the development of deformities and loss of function Proper splinting is most *important. The whole hand* especially the thumb, must be splinted in the position of function based on stabilizing splints to which if necessary traction can be added Most cases which have been neglected and in which contractures deformities and limitation or loss of function have developed, must be corrected by operation Simple skin contractures may be relieved by Z plasty With extensive skin contractures after burns and trauma, the scar is excised and a full thickness or thick

(8) New England J Med. 254:677-684, April 12 1956.

intermediate thickness graft is applied (Figs 113 and 114) Deeper contractures require the excision of all deep contracted tissues as well as (usually) the adductor pollicis and first dorsal interosseus muscles and part of the palmar aponeurosis generally followed by a pedicle skin graft over the skin defect Rarely a bone strut may be used Usually however crossed Kirschner wires are adequate to maintain the



Fig. 113 (left) —Adduction contracture of right thumb.
Fig 114 (right) —Same hand, with opposition restored after excision of scar and skin grafting
(Courtesy of Flynn, J E. New England J Med 254:677-686 April 12, 1956.)

proper relations between the first and second metacarpals and the proximal phalanx. The wires are removed in about nine weeks In most instances some active rotation of the thumb or its remnant results Tendon transfer to help re-establish active opposition may be necessary occasionally

Carpal Boss is probably of acquired origin Repeated slight trauma causing pressure at the involved joint may be one factor Another hypothesis is that trauma causes a slight rupture of the dorsal ligament of the involved joint with subsequent spur formation Many of the cases reported have

occurred in persons in occupations requiring frequent movement of the fingers such as typists The usual complaint if any is mild aching and easy fatigability of the wrist.

Norman Dorosin and James G Davis[9] (Los Angeles) describe the essential clinical feature as a small bony tumor on the dorsal aspect of the wrist over the third metacarpal



Fig. 115 (top) —Tumor elevation on dorsum of right wrist.
Fig. 116 (bottom) —Lateral view of right wrist.
(Courtesy of Dorosin, N and Davis, J G.: Radiology 66:234-236, February 1956.)

carpal joint (Fig 115) This is best demonstrated by x rays in the lateral projection in palmar flexion (Fig 116) There is a bony overgrowth of the dorsal aspect of both the capitate and the third metacarpal bones at the joint margins producing a characteristic double beak or bossing No erosion sclerosis of the joint margin or narrowing of the joint space is evident.

In a patient treated by the authors a bony exostosis with overlying thickened bursa arising from the capitate bone and impinging on the metacarpal was removed. No evi-

(9) Radiology 66:234-36, February 1956.

jury When the injury is beyond the distal flexion crease, nerve repair should not be attempted However if the nerve trunk is of sufficient diameter to accommodate one or two sutures approximation is in order (Fig 117) In all in



Fig 117 (above left) —Common volar digital nerve, repaired distal to distal flexion crease. Nerve branches here send inferior twig to supply pulp and superior twig to nail bed. These divisions have been sutured to main trunk. No. 6-0 silk hold sutures have been placed; palmar surface has been rotated dorsally to aid suturing of volar portion of nerve. Vessels of neurovascular bundle can be seen inferior to retracted nerve. Wound extends along dorsolateral aspect of finger.

Fig. 118 (above) —Two stay sutures have been placed and rotated so that palmar surface of superficial branch of ulnar nerve becomes dorsal. Extensor tendons to little finger are seen deep to nerve.

Fig 119 (left) —Approximation of neurilemma is completed by interrupted sutures placed between steadying sutures. No. 6-0 silk in nontraumatic needle can be seen passing through sheath of an unrepaired nerve. Needle lies on an extensor tendon.

(Courtesy of Nemethi, C E California Med. 84:35 38 January 1956.)

stances nerve damage should be appraised by sensory tests

TECHNIC —The first suture is passed only through the neurilemma, and as close to the cut edge as feasible. The directly opposite sheath is caught by the same suture matching corresponding sheath vessels and axons. The suture is then tied and held by a small hemostat. An identical suture is placed diametrically opposite the first

one and secured by a hemostat. The nerve is now stabilized, and two or more sutures are easily placed, tied and cut at the knot (Figs. 118 and 119) One of the holding hemostats is passed under the other one over the nerve rotating the dorsal aspect toward the palmar side. This permits easy suturing All sutures are cut flush at the knots and the juncture site is rolled over a blunt hemostat to insure accurate approximation of neurilemma and alinement of axon bundles Soft fatty tissue mobilized around the suture site prevents adhesions and affords protection against moving parts.

In 95% of patients treated the nerve repair resulted in usefully functioning digits in the other 5% loss of soft tissue and bone had been too extensive to permit adequate restoration of function

Combined Nerve and Tendon Injuries in Hand and Forearm. Vinton E Siler[3] (Univ of Cincinnati) recommends the following treatment for these injuries As first aid the wound should immediately be covered with a layer of sterile gauze dressings or other clean cloth Gauze bandage applied firmly over this will usually control arterial and venous bleeding Elevation of the extremity will reduce blood flow to the distal parts Rarely is a tourniquet around the arm or forearm needed to control hemorrhage.

In general primary tenorrhaphy and neurorrhaphy is advocated with certain exceptions When nerve and tendon are divided in the digit from the metacarpophalangeal joint distalward (zone 1) primary tendon repair within the narrow fibrous flexor sheath becomes the major issue. Here secondary tenorrhaphy with or without tendon graft is suggested In any event the digital nerve is repaired at the time of tenorrhaphy In the palmar area from the distal edge of the transverse volar ligament to the metacarpophalangeal joint (zone 2) primary tenorrhaphy and neurorrhaphy are the procedures of choice likewise for combined nerve and tendon injury located in the region from the distal edge of the transverse volar ligament proximalward (zone 3)

The second general consideration is based on time—the interval between injury and the surgical care of the wound Conversion of the contaminated wound to a clean surgical wound is advocated if started within six hours after injury

(3) Am. Surgeon 22:764-779 August, 1956.

When this is not possible the wound should be cleansed devitalized tissue and foreign bodies removed, and the skin edges approximated after securing hemostasis Definitive treatment then becomes a secondary procedure and should be done as soon as possible

In the operating room with the patient under general anesthesia neurorrhaphy and tenorrhaphy are done in a bloodless field by means of the pneumatic tourniquet Usually the wound of violence is lengthened by properly placing the distal and proximal arms in physiological planes. By identifying normal tissue the point of division of nerve and tendon can easily be delineated Tenorrhaphy is generally done before repair of the divided nerve Multiple interrupted silk sutures are recommended in the repair of severed nerves

In neurorrhaphy as in tenorrhaphy the line of suture is important and healing progresses best without any tension. Neurolysis may be necessary to remove tension Proper flexion of the hand on the wrist and of the phalanges on the metacarpal bones aids in reducing excess strain on the suture line. The ideal position can be maintained by intelligent splinting of the hand and forearm Primary neurorrhaphy affords immediate continuity of the damaged nerve early regeneration of the axons no need for a period of delay for observation and less likelihood of the complication of neuroma

Siler surveyed 107 combined nerve and tendon injuries. They were seen more frequently at the wrist (zone 3) than elsewhere in the hand Primary repair afforded good to excellent results when the injury was confined to either zone 2 or zone 3 however the results were poor when the injury occurred in zone 1 Such injuries in zone 1 have been a serious problem In the future better functional results will perhaps be dependent on improved methods of secondary repair either with or without tendon transplant.

Restoration of Function of Extensor Pollicis Longus Muscle after Spontaneous Rupture and Injuries. H Nigst[4] (Univ of Basel) reports on four cases of spontaneous rupture and two of injury Three autoplastic tendon transplantations and three anastomoses were performed The exten

(4) Helvet chi acta 22 504-512, December 1955

sor hallucis longus tendon was used for transplantation in two instances and the palmaris longus in one Anastomoses were made between the distal stump of the extensor pollicis longus and the extensor indicis proprius In one case simultaneous side to-side anastomosis of the proximal stump was effected with the tendon of the extensor indicis proprius Patients with transplantations had immobilization in hyperextension for four weeks and those with anastomoses for three weeks Active exercises were then started

Results in general were good and all patients were satisfied with the function obtained Five achieved full extension one who had an anastomosis had a loss of 20% three months after operation but the final result was not conclusive All patients secured an almost normally useful hand and all but one are active in their original vocation

Follow up indicated that thumb extension following transplantation is of greater range and stronger than that following anastomosis Range of movement depends on tension span of the operated tendon Logically function should be better if normal direction of movement is retained i e if the activator uses the groove occupied by the extensor pollicis longus Tension span is determined by the surgeon In general too much is better than too little Suture was never placed in an extreme position of extension in these cases

For technical reasons the activator could not be placed in the groove of the extensor pollicis longus in every case but this did not prove disadvantageous Best functional result was noted in a case in which the sulcus was by passed. In transplantation cases correct choice of tension span determines the end result This factor is also of major significance in anastomoses Theoretically even with an initially correct tension a loss of extension may exist because the extensor indicis proprius is not so strong as the extensor pollicis longus for which it is substituting and consequently cannot counteract the force of the antagonistic flexor pollicis longus

Flexor Tendon Repair in Hand Analysis of Management and Results in 41 Cases with Special Reference to Pollicis Repair and Accessory Sheath, is presented by G S

Muller Botha[5] (Birmingham England) No patients with complications such as extensive loss of skin multiple in volvement of digits fractures or extensive destruction of soft tissue were included in the series 70% were over age 15

Primary wound cleansing and skin closure were done in 28 patients Primary treatment is as important as delayed repair or subsequent rehabilitation Primary tendon suture seems to be the ideal approach but if not feasible primary wound cleansing and skin closure with subsequent (de layed) repair is suggested If it appears that tendon repair will not yield satisfactory results primary amputation is advisable Overcoming adhesions in the rigid thecal cylinder is the greatest problem in restorative surgery Adhesions can be prevented by partial or complete thecal resection or by replacing the injury site with a smooth healthy tendon graft

The flexor pollicis longus is usually damaged over the proximal phalanx, where it may be sutured primarily or repaired later by direct suture graft or transplant Because contracture sometimes develops after a long incision to ex pose the retracted proximal tendon end Botha exposes the distal stump by small extensions of the wound The long flexor is exposed above the wrist by a small curved incision and an opening made in the synovial sheath After delivery of the tendon a soft probe is passed inside the synovial sheath distally taking the threaded tendon end along The thin sheath is excised over the suture line excursion. This was done in the early clean case as a primary procedure and in the delayed suture or graft.

In classifying results cosmetic appearance function and age and occupation are important In the author's series over all success rate was 56% These results compare favor ably with those of other series

Conservative Treatment of Pseudarthrosis of Os Navicu lare of Hand With Five Illustrations. Pseudoarthrosis can be healed by (1) leading back the scattered regenerative process to its starting point and letting the whole healing procedure resolve i e all methods which create a new bone

(5) South African M J 30:726-735 A g 4 1956.

wound Kirschner's splintering pseudarthrosis resection with bone graft and spongiosa transplantation (2) excluding for a sufficient period the mechanical forces hostile to ossification which led to pseudarthrosis The connective and cartilage tissue is thereby at first dissolved by resorptive processes and then led to ossification

Exclusion of all hand and finger movements including rotatory movements of the forearm provides the condition necessary for pseudarthrosis consolidation of the scaphoid of the hand Therapeutically the aim must be to keep any mechanical insults away from the pseudarthrosis space for a sufficient time by a well arranged plaster of paris cast. Walter Duben and Heinz Gelbke[6] (Univ Clinic Göttingen) suggest the following method

TECHNIC.—An unupholstered plaster of paris cast is arranged to guarantee absolute immobilization of the fragments which is only possible when all finger and hand movements including the rotatory movement of the forearm, are excluded. This is the essential point of the special bandaging technic. Only the fingerpoints and the free nail beds are excluded from the plaster cast to control the blood circulation A volar gypseous splint of normal strength, applied in dorsal flexion of the wrist and in semiflexion of the fingers serves as a base for the bandage. Circular tours complete the closed plaster cast.

The cast is changed every six to eight weeks and x rays are taken each time Immobilization is continued until the fracture space is largely ossified i e after 3-4½ months Under the protection of a dorsal gypseous splint the first finger movements and four weeks later full functioning of the hand are allowed Heavy labor with the hand should be forbidden for another four weeks Of 30 pseudarthroses and old fractures treated in this way 25 healed osseously

Conservative treatment should not be used in patients with serious secondary arthrotic metamorphoses and considerable dissimilarity of the fracture surfaces or with pseudarthrosis with greater dislocation These patients are generally resistant to therapeutic measures

It is suggested that the fresh scaphoid fracture should also be supplied with a similar plaster bandage in order to prevent a delayed healing

[6] Acta orthop scandinav 26 53, 1956

Ruptures of Extensor Aponeurosis at Distal Digital Joints are common and easily diagnosed M Backdahl[7] (Sahlgrenska Hosp Göteborg) reviewed the results of different treatment methods by making one to two year follow up studies on 52 patients with extensor rupture at the distal phalanx of the finger

Patients with fresh injuries hospitalized within a week after injury had generally been treated with immobilization in plaster Patients with an older injury or those unimproved after previous treatment were usually operated on In some instances the rupture had been left without treatment (15 patients) The immobilization in plaster of paris was performed with the distal joint in greatest possible hyperextension and the proximal interphalangeal joint flexed at 90 degrees Immobilization lasted four to seven weeks Bunnell s technic was used in the patients operated on (18) The ruptured aponeurosis was sutured possibly after resection with stainless steel wire and the finger immobilized in plaster

From the follow up studies these principles developed If the extension defect is less than 30-40 degrees and no special indications are present treatment is given only for pain and the patients return to work almost immediately Treatment aiming to restore full extension capacity is given only for special reasons—e g when there are (*a*) ruptures coexisting with fractures and other ruptures where the extension defect is so great that it will probably cause persistent disability (*b*) ruptures of the extensor aponeurosis of the thumb or (*c*) pronounced cosmetic defects Treatment then consists of immobilization in plaster in patients seen within 10 days after injury The technic is difficult and is only used for fingers which have slender phalanges and in which the distal joint can be hyperextended Older injuries and stiff fingers should be treated surgically

Osteoarthritis in First Carpometacarpal Joint Investigation of 22 Cases is presented by Snorre Aune[8] The condition is characterized by insidious onset slow progression stiffness of the joint that decreases with movement and a

(7) Acta chir scandinav 111 151 157 1956.
(8) Ibid. 109 449 456 1955

dull ache aggravated by effort cold and occasionally climatic changes Later progressive loss of power of the thumb occurs Sooner or later there is an exacerbation of symptoms with sharp pains often radiating aggravated by movement. Ultimately considerable crippling of the hand is apparent. The joint is thickened partly due to prominence of the proximal end of the first metacarpus and partly to swelling of the periarticular tissue A relative degree of ulnar deviation of the first metacarpus atrophy of thenar muscles decreased active and passive mobility of the joint



Fig. 120 —Condition after about one year's duration of symptoms. (Courtesy of Aune, S Acta chir scandinav 109 449-456, 1955)

which is painful on touch crepitus and commonly abnormal mobility are present On provocation the metacarpal may be subluxated in proximal and radial direction Figure 120 shows the x ray appearance of the condition

Review of data on 63 men and 96 women over age 40 revealed no history of noticeable trauma of the thumb or wrist No discomfort was noticed by eight patients Among 22 patients studied more closely all showed bilateral changes by x ray Similar complaints were found among the families of 12 patients

In certain patients the condition may be caused by malformation of the joint surfaces or the trapezium with resulting instability and subluxation of the joint Heredity

may be of some importance X ray therapy is commonly used especially at exacerbation of symptoms when the condition becomes crippling With long standing disease, satisfactory results are obtained by use of a splint beginning with complete immobilization and followed by a rest splint at night only and combined with active physical therapy

Arthrodesis and Tenodesis of Distal Joint of Finger for Isolated Rupture of Deep Flexor Tendon were done by O Biström[9] (Helsinki)

TECHNIC.—The skin is incised. The point of attachment of the deep flexor to the end phalanx is laid bare and the tendon cut off

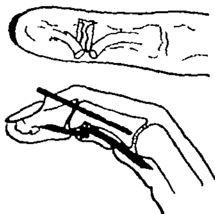


Fig. 121.—Arthrodesis and tenodesis of distal joint of finger (Courtesy of Biström, O : Ann. chir et gynaec. Fenniae 44:241 244 1956.)

about 1 cm. proximally to it. A cross-section is made in the ventral cartilage disk above the distal interphalangeal joint. The base of the end phalanx and the trochlea of the second phalanx are resected with a thin, straight, narrow chisel to form a wedge, with the base being directed toward the inside of the finger When the bones are joined, the required angle is obtained. Chiseling should be done gradually to obtain the angle required as closely as possible. With the phalanges in angular position and from a point immediately proximal to the nail matrix, a Kirschner thread is passed through the base of the end phalanx into the second phalanx almost to its base, though it need not be taken right through the base. The Kirschner thread is cut off 1 cm distal to the bored opening The phalanges are now firmly established in their angular position.

An adequate section is excised from the ventral cartilage of the cross section edge and closed with thin metal sutures. This excision contributes to maintaining the angular position. Finally a duplica

(9) Ann. chir et gynaec Fenniae 44 241 244 1956.

tion of the deep tendon stumps is fastened with metal sutures which should as far as possible, pass through the periosteum of the second phalanx. This suture also contributes to maintaining the angular position. The skin incision is approximated with metal sutures and the finger immobilized with a dorsal plaster splint from the tip of the finger to the back of the hand. The proximal interphalangeal joint is then semiflexed (Fig 121) The Kirschner thread is kept in place for three weeks After removal immobilization is prolonged for another week.

The desired results were achieved in all patients No infections occurred A prerequisite for surgery is comparatively good functional capacity of the superficial flexor tendon.

Arthrodeses of the Wrist. R. Merle d Aubigné and J Latastet (Paris) made a study of 51 of 60 arthrodeses of the wrist carried out since 1947 of the other 9 5 were too recent (less than four months) records were incomplete for 2 (x ray films missing) and 2 had not been seen since the second month after operation More than two thirds of the arthrodeses had been performed according to the Smith Petersen technic and it was now possible to define the advantages defects and indications of this technic more accurately than was done previously (Merle d Aubigne and Benassy 1949)

Lesions necessitating arthrodesis of the wrist fall into three major categories (1) traumatic lesions of the bone (2) nontraumatic lesions of the bone and (3) lesions of the soft parts (nerves tendons etc) In the series reviewed, there were 23 cases in the first category 10 in the second and 18 in the third The Smith Petersen technic had been used when it seemed appropriate but since the operations were performed by different surgeons the procedure had varied somewhat

Although radiologic results are difficult to evaluate arthrodesis may be considered an anatomic failure when the graft is not fused with the radius or the carpus or both and also when the radiocarpal interline is largely free alongside the graft Accordingly 7 of the 51 operations were failures —5 with the Smith Petersen technic, 1 with the same technic slightly modified and 1 with an atypical procedure (implantation of the cubitus in the carpus) Although the per-

(1) Rev chir orthop 4 185-206 Apr June 1956.

centage of failures with the Smith Petersen technic was high (6 of 36 cases or 16.7%) failure could be attributed to a technical error and should not be regarded as condemning the method Far more than the failures the poor clinical



Fig. 122.—Poor result from Smith-Petersen technic retreated by using large dorsal tibial graft, with excellent result and complete disappearance of radiocarpal interline. (Courtesy of Merle d'Aubigné R. and Lataste, J Rev chir orthop. 42:185-206, Apr June, 1956.)

results despite a satisfactory radiologic picture must be regarded as limiting the indications for the Smith Petersen technic The clinical results in these cases were classified as very good (complete freedom from pain good muscular strength prosupination superior to 90 degrees) good (complete freedom from pain reduced muscular strength pro-

supination from 30 to 90 degrees) fair (slight pain on movement reduced muscular strength prosupination from 30 to 90 degrees) and poor (pain at rest and on movement greatly reduced muscular strength interfering with activity prosupination blocked or nearly so) Taking the series as a whole poor results or failure occurred in 10 cases with the Smith Petersen technic (28% of 36) in 3 with other procedures (20% of 15) and in 1 of 6 in which reoperation was necessitated by late fracture of the graft (16 66%) Analysis of these cases showed that apart from failures and poor results due to technical errors the Smith Petersen technic is not applicable to old scaphoid lesions because such lesions are usually accompanied by a radioscaphoid arthrosis and because it is difficult to block this articulation by an internal approach Three such cases occurred in this series and were successfully corrected by the use of a large dorsal tibial graft (Fig 122)

Suitable indications for the Smith Petersen technic are found in lesions of the soft parts and in traumatic bone lesions without extensive loss of bone with involvement of the lower radiocubital but always without involvement of the radioscaphoid A modified form of the Smith Petersen technic with an additional external graft may be used in traumatic bone lesions without significant loss of bone but with involvement of both the lower radiocubital and the radioscaphoid In nontraumatic bone lesions generally and in the traumatic bone lesions in which the radiocubital is intact or there is extensive bone loss a large dorsal graft (radiocarpal or radiocarpometacarpal) is indicated and should be used

Prognosis and Treatment of Dupuytren s Contracture In a study of 100 patients Raoul Tubiana[2] (Paris) found the site and degree of the lesions choice of treatment and surgical technic the most important factors in prognosis Results of treatment are much better if surgery is performed early When the condition tends to progress especially when the interphalangeal joints are affected immediate surgery should be undertaken Once the condition has passed a certain stage removal of the palmar fascia including all

( ) J Bone & Joint Surg 37 A 1155-1168 December 1955

centage of failures with the Smith Petersen technic was high (6 of 36 cases or 16.7%), failure could be attributed to a technical error and should not be regarded as condemning the method Far more than the failures the poor clinical



Fig 122 —Poor result from Smith Petersen technic retreated by using large dorsal tibial graft, with excellent result and complete disappearance of radiocarpal interline. (Courtesy of Merle d Aubigne R. and Lataste J Rev chir orthop. 42:185-206, Ap June, 1956)

results despite a satisfactory radiologic picture must be regarded as limiting the indications for the Smith Petersen technic The clinical results in these cases were classified as very good (complete freedom from pain good muscular strength prosupination superior to 90 degrees) good (complete freedom from pain reduced muscular strength pro-

supination from 30 to 90 degrees) fair (slight pain on movement reduced muscular strength prosupination from 30 to 90 degrees) and poor (pain at rest and on movement greatly reduced muscular strength interfering with activity supination blocked or nearly so) Taking the series as a whole poor results or failure occurred in 10 cases with the Smith Petersen technic (28% of 36) in 3 with other procedures (20% of 15) and in 1 of 6 in which reoperation was necessitated by late fracture of the graft (16 66%) Analysis of these cases showed that apart from failures and poor results due to technical errors the Smith Petersen technic is not applicable to old scaphoid lesions because such lesions are usually accompanied by a radioscaphoid arthrosis and because it is difficult to block this articulation by an internal approach Three such cases occurred in this series and were successfully corrected by the use of a large dorsal tibial graft (Fig 122)

Suitable indications for the Smith Petersen technic are found in lesions of the soft parts and in traumatic bone lesions without extensive loss of bone with involvement of the lower radiocubital but always without involvement of the radioscaphoid A modified form of the Smith Petersen technic with an additional external graft may be used in traumatic bone lesions without significant loss of bone but with involvement of both the lower radiocubital and the radioscaphoid In nontraumatic bone lesions generally and in the traumatic bone lesions in which the radiocubital is intact or there is extensive bone loss a large dorsal graft (radiocarpal or radiocarpometacarpal) is indicated and should be used

Prognosis and Treatment of Dupuytren s Contracture In a study of 100 patients Raoul Tubiana[2] (Paris) found the site and degree of the lesions choice of treatment and surgical technic the most important factors in prognosis Results of treatment are much better if surgery is performed early When the condition tends to progress especially when the interphalangeal joints are affected immediate surgery should be undertaken Once the condition has passed a certain stage removal of the palmar fascia including all

J Bone & Joint Surg 37 A 1155 1168 December 1955

the palmar and digital area involved remains the sole effective treatment

Results of removal of palmar fascia in 56 hands with follow up of six months to five years were very good in 43% good in 34% fair in 20% and poor in 3%

Hydrocortisone Acetate in Treatment of Dupuytren's Contraction and Allied Conditions Like cortisone hydro-

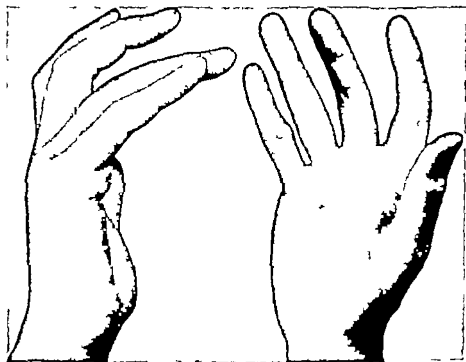


Fig 123 —Ulnar (on left) and volar (on right) aspects of hand with Dupuytren's contraction, with tense cords to ring finger and flexion contraction. (Courtesy of Zachariae, L. and Zachariae F Acta chir scandinav 109 421-431 1955)

cortisone has a markedly inhibitory effect on mesenchymal tissue and the slightly soluble acetate applied topically to fibroses of various kinds has softened these structures As Dupuytren's contraction and allied conditions such as plantar fibrosis and plastic induration of the penis are also fibroses L. Zachariae and F Zachariae[3] (Copenhagen) tried hydrocortisone acetate in treating these lesions The series included 20 hands with Dupuytren's contraction (Fig 123), 11 of which were treated without operation and 9 for

(3) Acta chir scandinav 109 421-431 1955

postoperative fibrosis In addition three patients with plantar fibrosis and two with Peyronie s disease were treated.

Treatment consisted of weekly injections of hydrocortisat R—in nonsurgical patients without further treatment, and in surgical patients with physical therapy Treatment was given on an outpatient basis Most patients had 25 mg/

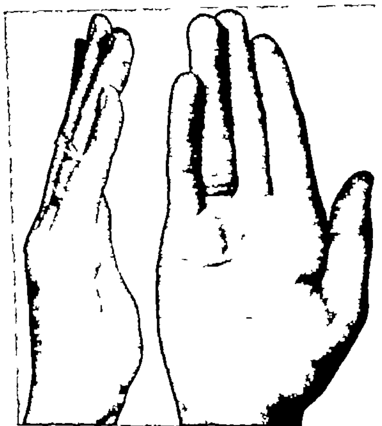


Fig. 124—About one month after topical injections of hydrocortisone acetate. (Courtesy of Zachariae L., and Zachariae, F Acta chir scandinav 109 421-431 1955)

week for two to five weeks Only one required local anesthesia

Good results were obtained especially in new cases the fibrosis being softened, contraction reduced (Fig 124) and any pain relieved A few severe cases failed to respond

The authors point out that surgery remains the usual method of treatment in Dupuytren s contraction but when complicating conditions such as heart disease contraindi-

cate operation hydrocortisone may be used topically and may also be indicated in mild cases especially during periods of pain and tension. In postoperative fibroses, topical injection of hydrocortisone may be widely used with good results

► [*The success reported by these authors following injection of hydrocortone into the contracted and thickened palmar fascia and in other conditions of hard fibroses should encourage all surgeons to try this type therapy before subjecting their patients to surgery for the conditions described.—Ed.*]

Reconstructive Surgery of Hands with Injured Central Metacarpophalangeal Joints is discussed by Erle E Peacock Jr [4] (Univ of North Carolina) After injury to the center of the hand the central digits may be anatomically intact distal to their metacarpophalangeal joints and still be functionally worthless This problem is of unusual interest as it often affords opportunity to use good tissue from one finger to rebuild another the supposition being that two bad fingers can be used to build a good one

The decision as to which digit should be sacrificed involves several considerations the most important being the status of the metacarpophalangeal joint Wounds in the center of the hand may be further complicated by damage to the motor branch of the ulnar nerve and besides reconstruction of the damaged area, it may be necessary to plan for restoration of the power for pinch When a single metacarpophalangeal joint has been destroyed or ankylosed, the following procedures should be considered capsulotomy amputation with or without transfer of the adjacent metacarpal fusion and recession of the proximal phalanx into the palm

Capsulotomy may be attempted when ankylosis is only moderately severe and when the capsule and collateral ligaments are the only structures involved The dorsal extensor tendon splitting incision of Howard is generally accepted as the best approach for this procedure. After capsulotomy the metacarpophalangeal joint must be kept in a position of flexion

Metacarpal transfer when done correctly does not endanger the viability of the transferred finger (Fig 125) An in

(4) J. Bone & Joint Surg. 38-A 291-302, April, 1956.

terdigital flap prevents any scarring in the web space, where maximal elasticity is desired Kirschner wire fixation in two planes maintains perfect bone alinement in the transferred



Fig 125 (left) —Preoperative view Index finger and metacarpal have not yet been transferred to base of third metacarpal.

Fig. 126 (below left) —Position of Kirschner wires postoperatively

Fig 127 (below) —Final result after metacarpal transfer of index finger

(Courtesy of Peacock, E. E. Jr J Bone & Joint Surg. 38-A 291 302 April, 1956)





finger (Fig 126) Metacarpal transfer has been as successful for the fifth finger as for the index finger (Fig 127)

Fusion of a metacarpophalangeal joint may be considered if the joint is painful and unstable but the distal portion of the finger is still useful The case for fusion is strengthened when there are no other defects for which the tissue from

cate operation hydrocortisone may be used topically and may also be indicated in mild cases especially during periods of pain and tension In postoperative fibroses topical injection of hydrocortisone may be widely used with good results

► [The success reported by these authors following injection of hydrocortone into the contracted and thickened palmar fascia and in other conditions of hard fibroses should encourage all surgeons to try this type therapy before subjecting their patients to surgery for the conditions described.—Ed.]

Reconstructive Surgery of Hands with Injured Central Metacarpophalangeal Joints is discussed by Erle E. Peacock Jr [4] (Univ of North Carolina) After injury to the center of the hand the central digits may be anatomically intact distal to their metacarpophalangeal joints and still be functionally worthless This problem is of unusual interest as it often affords opportunity to use good tissue from one finger to rebuild another the supposition being that two bad fingers can be used to build a good one.

The decision as to which digit should be sacrificed involves several considerations the most important being the status of the metacarpophalangeal joint. Wounds in the center of the hand may be further complicated by damage to the motor branch of the ulnar nerve and besides reconstruction of the damaged area *it may be necessary to* plan for restoration of the power for pinch When a single metacarpophalangeal joint has been destroyed or ankylosed the following procedures should be considered capsulotomy amputation with or without transfer of the adjacent metacarpal fusion and recession of the proximal phalanx into the palm

Capsulotomy may be attempted when ankylosis is only moderately severe and when the capsule and collateral ligaments are the only structures involved The dorsal extensor tendon splitting incision of Howard is generally accepted as the best approach for this procedure. After capsulotomy the metacarpophalangeal joint must be kept in a position of flexion

Metacarpal transfer when done correctly does not endanger the viability of the transferred finger (Fig 125) An in

(4) J Bone & Joint Surg 38-A:291 302, April, 1956.

terdigital flap prevents any scarring in the web space where maximal elasticity is desired Kirschner wire fixation in two planes maintains perfect bone alinement in the transferred



Fig 125 (left) —Preoperative view Index finger and metacarpal have not yet been transferred to base of third metacarpal.
Fig. 126 (below left) —Position of Kirschner wires postoperatively
Fig 127 (below) —Final result after metacarpal transfer of index finger
(Courtesy of Peacock, E. E. Jr J Bone & Joint Surg. 38-A:291 302, April, 1956.)





finger (Fig 126) Metacarpal transfer has been as successful for the fifth finger as for the index finger (Fig 127)

Fusion of a metacarpophalangeal joint may be considered if the joint is painful and unstable but the distal portion of the finger is still useful The case for fusion is strengthened when there are no other defects for which the tissue from

the damaged finger could be more effectively utilized. It should be remembered however that fusion of a central metacarpophalangeal joint is not a sound procedure from a functional standpoint.

Recession of a digit avoids both limitation of flexion imposed by fusion and narrowing of the transverse arch which follows metacarpal transfer The object of the operation is to sacrifice the skin covering the proximal phalanx and to recess this phalanx into the palm as a metacarpal bone graft so that the proximal interphalangeal joint will serve as a metacarpophalangeal joint

► [The surgical procedures recommended are practical and should improve the function of the injured hand. Those interested in hand surgery should read the original article carefully.—Ed.]

Reconstructive Surgery of Hand in Cerebral Palsy and Spastic Paralysis Resulting from Injury to Spinal Cord. Most hand deformities due to cerebral palsy do not warrant surgery but in selected instances surgery with splinting stretching and muscle re education may aid in rehabilitation Surgery is more likely to be successful in cerebral spastics and in patients with spasticity due to injury to the spinal cord than in those with other forms of cerebral palsy

Surgery was performed by J Leonard Goldner[5] (Duke Univ) in patients with enough intelligence to follow through with re-education and enough initiative to take advantage of the anatomic improvement Indications were thumb-in palm deformity flexion or extension deformities of the index finger flexion deformities of the long ring and little fingers flexion deformity of the wrist instability of joints and localized paralysis of specific muscle groups The goal was to secure active or passive grasp and release and to provide or improve pinch

The operative procedures were arthrodesis of the wrist joint or of the metacarpophalangeal joint of the thumb rerouting of the extensor pollicis longus transfer of the wrist flexors to the extensors of the wrist, finger or thumb opening of the thumb web opponens transfer arthrodesis of the interphalangeal joints transfer of the flexores digitorum profundi to the flexores digitorum sublimes section of the lateral bands (index finger) and replacement for weakness of the intrinsic muscles to the index finger

(5) J Bone & Joint Surg. 37 A:1141 1154 December 1955

Selective tenotomies and tendon transfers can improve function of the hand in certain patients with cerebral palsy or with spasticity due to trauma to the cervical cord but even with a carefully chosen and well executed program failures occur Tendon surgery if indicated is done as the initial procedure and is followed when necessary by joint arthrodesis Arthrodesis of the metacarpophalangeal joint of the thumb is a useful procedure The position of the wrist for arthrodesis should be determined carefully before the definitive operation

► [Physicians and surgeons have been inclined to shun the cerebral palsy patients or to give them the "brush-off" This has, in part, been due to the fact that all doctors have felt frustrated when they have tried to figure out some way of really helping these unfortunate patients.

Goldner has given us some valuable suggestions and has described techniques whereby thousands of cerebral palsy patients who have been neglected in the past can be greatly helped. This is a splendid article and should be studied in detail by all surgeons trained in the disciplines of reconstructive surgery of the hand.—Ed.]

THE HIP LEG KNEE AND ANKLE

Treatment of Coxa Plana Follow up Examination was done by M Foss Hauge[6] on 100 patients with 132 coxa plana who had been treated for a year with bed rest Evaluation of therapeutic results was based on the shape of the caput femur judged from x ray appearance A ball shaped joint head was considered to be a good result a flattened but evenly rounded caput a fair result and an angular caput a poor result When rest treatment was started in the initial stage 62.5% of the patients showed good results whereas when it was begun in the fragmentation stage only 19 6% showed good results The younger the patient the better the prognosis after lengthy bed rest. Possibly results would improve with longer rest, e.g., an average of 1½ years

Pathology of Slipping of Upper Femoral Epiphysis was studied by Ignacio V Ponseti and Robert McClintock[7] (State Univ of Iowa) in three children aged 11-14 with clinical and x ray (Fig 128) findings typical of the early stages Core biopsies of the femoral neck and head were

(6) Acta orthop scandinav 26 53-63 1956.
(7) J Bone & Joint Surg. 38-A 71-83 January 1956.

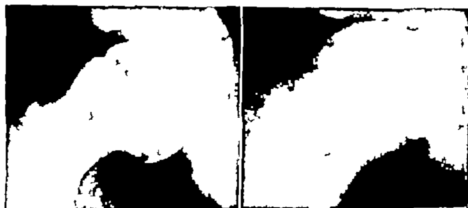


Fig. 128.—Lateral and anteroposterior views of right hip; note minimal epiphyseal slipping. (Courtesy of Ponseti, I. V., and McClintock, R.: J. Bone & Joint Surg. 38-A:71-83, January, 1956.)



Fig. 129.—Area of endochondral ossification in metaphyseal side of specimen. Note cartilage cells separated by clefts and large tongue of disarranged cartilage penetrating deep into the metaphysis. Hematoxylin-eosin; reduced from ×50. (Courtesy of Ponseti, I. V., and McClintock, R.: J. Bone & Joint Surg. 38-A:71-83, January, 1956.)

done with a Phemister punch 1 cm in diameter introduced through the outer aspect of the upper femoral shaft into the center of the femoral neck and head The specimens usually broke at the junction of the epiphysial plate with the metaphysis Both pieces of bone were wrapped in gauze to keep them in their anatomic position during decalcification and embedding in celloidin Slides were obtained from the blocks

The epiphysial plate was wide and greatly disrupted with clefts in areas of the plate (Fig 129) There were no signs of rickets osteomalacia osteoporosis or infection The epiphysial plate lesion appears to be due to loss of cohesion of the cartilage matrix, presumably caused by an alteration of the chemical composition of the ground substance The lesion may be mainly responsible for the epiphysial slipping Metabolic studies of the children showed an abnormality in the protein metabolism similar to the one found in children with adolescent scoliosis The epiphysial plate lesions were similar to those observed in experimental animals fed minimal amounts of aminonitriles

► [Those who are interested in the pathology of slipping of the upper femoral epiphysis should read this article and study the excellent photomicrograph reproductions.—Ed.]

Slipped Upper Femoral Epiphysis Early Recognition and Treatment are discussed by S J O Connor and J C Ivanoff[8] (Univ of Michigan) Though onset of symptoms may be painful and dramatic and associated with precipitating trauma it usually is insidious with a history of gradually progressing or intermittent pain in the affected hip often referred along the course of the obturator nerve to the anterosuperior and medial aspect of the knee on the involved side Knee pain alone may be present

Bilateral hip *involvement is present in 25-35% of patients* including many with only unilateral signs and symptoms and adequate biplane x rays are always necessary Usually a progressively painful limp irritability of the hip and difficulty in weight bearing are noted Rest relieves these symptoms activity makes them worse An established flexion contracture at the hip may be found and loss of internal rotation and increased external rotation and of abduction

(8) J Michigan M. Soc. 55 188-191 February 1956.

and increased adduction are present It is important to note that, when actively flexed the hip demonstrates flexion and external rotation (Fig 130) Thigh atrophy may be evident.

Surgery is directed toward three objectives according to the type and degree of displacement (1) internal fixation in situ (2) reduction—manipulative open or both—and internal fixation and (3) osteotomy transcervical or subtrochanteric with internal fixation to correct established deformity These technics are designed to transfix and im



Fig 130—Hip flexion with external rotation on right (Courtesy of O Connor S. J and Ivanoff J C. J Michigan M Soc 55 188 191 February 1956)

mobilize the epiphysis until closure of the epiphysial line occurs

► [The simple test shown in Figure 3 should be utilized by every orthopedic surgeon who is examining a patient with pain in the knee or in the region of the hip If there is any slipping the flexed thigh cannot be adducted, and a lateral x ray taken in this position will show the posterior displacement of the head of the femur—Ed]

Fresh Whole-Thickness Skin Autograft with Adipose Tissue as Interposition Material in Arthroplasty Skin-Cap Arthroplasty of Hip Since May 1954 K. E Kallio[9] (Helsinki) has used the skin-cap arthroplastic procedure in 40 patients with excellent results Use of a whole thickness skin autograft in arthroplasty offers the following advantages (1) The interposed material is biologic and can be adapted to the requirements of all the joints (2) Its ideal plasticity

(9) Semaine hôp. Paris (Med. monde) no 1 March, 1956.

makes it possible to preserve the form of the articular surfaces so that their adaptation is unchanged giving the patient a feeling of normal stability in walking (3) The dimensions of the caput collum can be preserved and as the so-called weight bearing area remains intact the operation does not weaken the mechanical resistance of the bone and the bone itself is less exposed to wear and tear (4) The operation is easy and does not require special instruments

TECHNIC—The graft is obtained from the skin of the abdomen. A circle 8 or 9 cm in diameter is drawn on the abdomen with a compass and a wire suture is threaded around the circumference so that it will be ready for use when needed (Fig 131) A circular incision is made with a bistoury ½ 1 cm outside the suture and the skin,

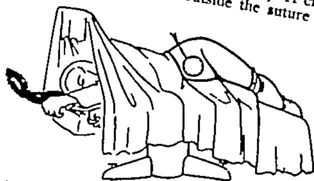


Fig 131—Passage of wire suture through abdominal skin. (Courtesy of Kallio, K. E Semaine hôp Paris (Med. monde) no. 1 March, 1956.)

with an appropriate thickness of adipose tissue, is removed. The edges of the skin defect are held together temporarily with drape clips The skin graft, with the adipose tissue uppermost, is shaped into a cap over a form and when the fit is satisfactory the graft is placed over the head of the femur like a pouch and held firmly in place by the wire suture which is pulled tight around the femur With a few catgut sutures the edges of the skin cap are fastened to the remnants of the capsule, and the operation is completed. The wound in the abdominal wall is closed with wire sutures

No infection or complications occurred and all the patients were thoroughly satisfied

► [A personal communication from Professor Kallio has submitted the information that microscopic studies of the experimental skin arthroplasties of the hip joints carried out on cats have demonstrated that the whole thickness skin graft with fatty tissue preserves its vitality and develops into hyaline cartilage The clinical results reported by Kallio on 52 consecutive clinical patients who were subjected to the skin arthroplasty procedure are reported as exceptionally good. The elapsed time since carrying out the first of these arthroplasties is only a little less than three years.

and increased adduction are present. It is important to note that, when actively flexed the hip demonstrates flexion and external rotation (Fig 130) Thigh atrophy may be evident.

Surgery is directed toward three objectives according to the type and degree of displacement (1) internal fixation in situ (2) reduction—manipulative open or both—and internal fixation, and (3) osteotomy, transcervical or subtrochanteric with internal fixation to correct established deformity These technics are designed to transfix and im



Fig 130—Hip flexion with external rotation on right. (Courtesy J O Connor S. J and Ivanoff J C. J Michigan M Soc. 55 188 191 February 1956)

mobilize the epiphysis until closure of the epiphysial line occurs

► [The simple test shown in Figure 3 should be utilized by every orthopedic surgeon who is examining a patient with pain in the knee or in the region of the hip. If there is any slipping the flexed thigh cannot be adducted, and a lateral x ray taken in this position will show the posterior displacement of the head of the femur —Ed.]

Fresh Whole-Thickness Skin Autograft with Adipose Tissue as Interposition Material in Arthroplasty Skin-Cap Arthroplasty of Hip Since May 1954 K E. Kallio[9] (Helsinki) has used the skin-cap arthroplastic procedure in 40 patients, with excellent results Use of a whole thickness skin autograft in arthroplasty offers the following advantages (1) The interposed material is biologic and can be adapted to the requirements of all the joints (2) Its ideal plasticity

(9) Semaine hôp. Paris (Méd. monde) no 1 March, 1956.

makes it possible to preserve the form of the articular surfaces so that their adaptation is unchanged giving the patient a feeling of normal stability in walking (3) The dimensions of the caput collum can be preserved and as the so-called weight bearing area remains intact the operation does not weaken the mechanical resistance of the bone and the bone itself is less exposed to wear and tear (4) The operation is easy and does not require special instruments

TECHNIC.—The graft is obtained from the skin of the abdomen. A circle 8 or 9 cm in diameter is drawn on the abdomen with a compass and a wire suture is threaded around the circumference so that it will be ready for use when needed (Fig 131) A circular incision is made with a bistoury ½ 1 cm outside the suture and the skin,

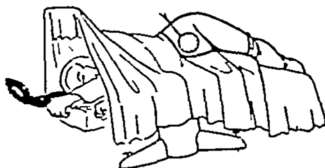


Fig 131—Passage of wire suture through abdominal skin. (Courtesy of Kallio, K. E. [illegible] (Med. monde) no. 1 March, 1956)

with an appropriate thickness of adipose tissue is removed. The edges of the skin defect are held together temporarily with drape clips The skin graft, with the adipose tissue uppermost, is shaped into a cap over a form, and when the fit is satisfactory the graft is placed over the head of the femur like a pouch and held firmly in place by the wire suture which is pulled tight around the femur With a few catgut sutures the edges of the skin cap are fastened to the remnants of the capsule and the operation is completed. The wound in the abdominal wall is closed with wire sutures

No infection or complication occurred and all the patients were thoroughly satisfied

► [A personal communication from Professor Kallio has submitted the information that microscopic studies of the experimental skin arthroplasties of the hip joints carried out on cats have demonstrated that the whole [illegible] skin graft with fatty tissue preserves its vitality and develops into hyaline cartilage. The clinical results reported by Kallio on 52 consecutive clinical patients who were subjected to the skin arthroplasty procedure are regarded as exceptionally good. The elapsed time since carrying out the first of these arthroplasties is a little less than three years.

Nevertheless, if the interpretation of the microscopic sections of the interposed skin has been correct in pronouncing that this has changed over into hyaline cartilage, this is a procedure which is deserving of a great deal more study It is hoped that orthopedic surgeons in the United States will utilize the technic in a sufficiently large number of cases to confirm or if the results are not equally good, to refute the claims of the author —Ed.]

Arthroplasty of Hip Pre- and Postoperative Management by Physical Medicine and Rehabilitation is reviewed by Shyh Jong Yue[1] (Columbia Univ) Physical therapy properly begins long before the operation When the patient is hospitalized (except in acute injury) instructions are initiated for walking on crutches without weight bearing on the side for which surgery is planned The patient with a painful hip should do muscle setting and active resistive exercises until the beginning of pain

Postoperatively and with knowledge of the specific operation performed the physiatrist supervises exercise of the hip toward the goal of improved functional results During the first phase—static—while the patient is not ready for active motion and is in a stage of immobilization physical therapy includes muscle setting exercises of all muscles around the hips knees and ankles of both sides and gentle passive flexion of the knee by manual support under the knee or with suspension slings General activity of uninvolved joints may be encouraged.

Next the patient begins exercises in the mobilizing phase of postoperative care Graded and increasingly active exercises are used commencing with active assistive measures and including abductive exercises which aid in subsequent hip stability Prophylactic strengthening of the dorsiflexors of the ankle also enables the patient to clear the ground while practicing walking Use of the therapeutic pool is advantageous in this phase

During the final phase—ambulation—general strengthening exercises with gradually increasing weight bearing are indicated Before the patient is discharged stair climbing and clearing of curbs should be taught.

Follow up after discharge is particularly important to encourage the patient to continue with physical rehabilitation At all points in postoperative management, the physiatrist should prevent movements that might traumatize the joint

(1) Arch. Phys. Med 37 267 275 May 1956.

widening of the stem canal with resorption of the upper end of the femoral neck. The appearance of prosthetic fractures varies according to the part or material involved.

If the metal core is broken the diagnosis is obvious (Fig 2) If only the plastic material of the stem is fractured, x rays may be suggestive of prosthetic loosening If the fracture occurs at the junction of the stem and head the position of the metal core and femoral neck is altered in relation to the acetabulum The arthrogram shows the head in eccentric relation to the core

These complications occurred in 15% of 62 patients apparently most often in those in active occupations Judet arthroplasty is indicated only in patients in whom the femoral head is not fit for cup arthroplasty and in whom only slight weight bearing on the joint is to be anticipated

Traumatic Necrosis of the Head of the Femur Distinguished from Pseudarthroses A Study According to R. Merle d Aubigne and Cormier[3] (Hôp Cochin) the strict initial localization of traumatic necrosis of the head of the femur and the late evolution of this necrosis toward an arthrosis comparable to nontraumatic coxarthroses enhance the study of the development and treatment of these lesions In pseudarthroses the displacement of the fragments constitutes an additional pathogenic factor and adds to the therapeutic problem consequently in order to consider only what is essential the present study was restricted to necrosis following traumatic dislocation and to necrosis of the femoral head after a consolidated fracture of the neck.

The frequency of necrosis after fracture and dislocation shows that intraosseous vascular anastomoses do not develop readily In traumatic dislocation the frequency of necrosis is proportional to the extent of the injury and the delay in its reduction The variability in the localization of the necrosis which sometimes affects the head as a whole sometimes the rounded upper part (Figs 133-135) and sometimes the superior supporting zone is probably due to variations in the vessels supplying the femoral head If the fracture is not reduced necrosis of the devascularized segment begins at once and may be seen in the x rays at the end of six weeks or two months If on the other hand the fracture surfaces

(3) Rev chir orthop. 42:246-267 Apr June, 1956.

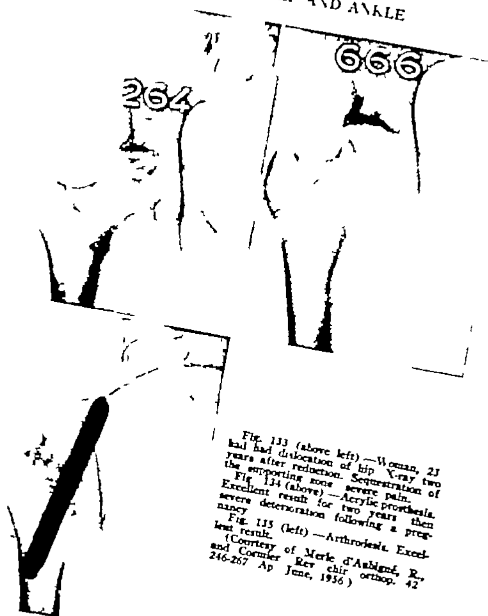


Fig. 133 (above left) —Woman, 23 had had dislocation of hip X-ray two years after reduction. Sequestration of the supporting zone severe pain.
Fig. 134 (above) —Acrylic prosthesis. Excellent result for two years then severe deterioration following a pregnancy
Fig. 135 (left) —Arthrodesis. Excellent result.
(Courtesy of Merle d'Aubigné, R., and Cornier Rev chir orthop. 42 246-267 Ap June, 1956)

are kept in contact a process of rehabilitation takes place, and the conjunctivovascular offshoots coming from the distal segment penetrate the head in a regularly progressive manner As this process develops however sequestra may form, and eventually a secondary deformation of the cotyledon and a true degenerative arthrosis of the hip

With these facts in mind the data obtained from a review

widening of the stem canal with resorption of the upper end of the femoral neck. The appearance of prosthetic fractures varies according to the part or material involved

If the metal core is broken the diagnosis is obvious (Fig 2) If only the plastic material of the stem is fractured, x rays may be suggestive of prosthetic loosening If the fracture occurs at the junction of the stem and head the position of the metal core and femoral neck is altered in relation to the acetabulum The arthrogram shows the head in eccentric relation to the core.

These complications occurred in 15% of 62 patients apparently most often in those in active occupations Judet arthroplasty is indicated only in patients in whom the femoral head is not fit for cup arthroplasty and in whom only slight weight bearing on the joint is to be anticipated.

Traumatic Necrosis of the Head of the Femur Distinguished from Pseudarthroses A Study According to R. Merle d Aubigné and Cormier[3] (Hop Cochin) the strict initial localization of traumatic necrosis of the head of the femur and the late evolution of this necrosis toward an arthrosis comparable to nontraumatic coxarthroses enhance the study of the development and treatment of these lesions In pseudarthroses the displacement of the fragments constitutes an additional pathogenic factor and adds to the therapeutic problem consequently in order to consider only what is essential the present study was restricted to necrosis following traumatic dislocation and to necrosis of the femoral head after a consolidated fracture of the neck.

The frequency of necrosis after fracture and dislocation shows that intraosseous vascular anastomoses do not develop readily In traumatic dislocation the frequency of necrosis is proportional to the extent of the injury and the delay in its reduction The variability in the localization of the necrosis which sometimes affects the head as a whole sometimes the rounded upper part (Figs 133-135) and sometimes the superior supporting zone is probably due to variations in the vessels supplying the femoral head If the fracture is not reduced necrosis of the devascularized segment begins at once and may be seen in the x rays at the end of six weeks or two months If on the other hand the fracture surfaces

(3) Rev chir orthop. 42 246-267 Apr Jun 1956.

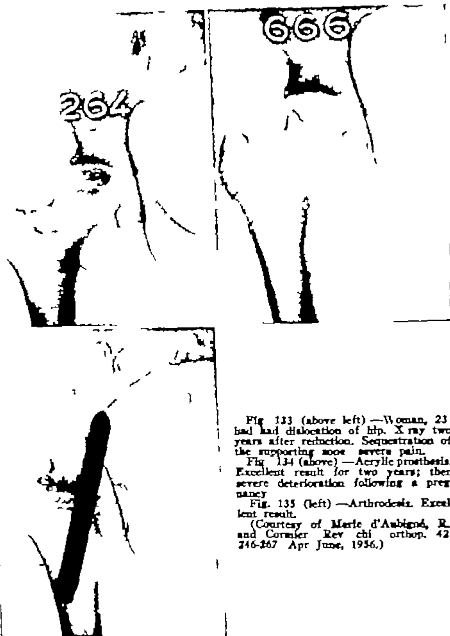


Fig 133 (above left) —Woman, 23 had had dislocation of hip. X ray two years after reduction. Sequestration of the supporting zone severe pain.

Fig 134 (above) —Acrylic prosthesis. Excellent result for two years; then severe deterioration following a pregnancy

Fig. 135 (left) —Arthrodesis. Excellent result.

(Courtesy of Merle d'Aubigné, R., and Cormier Rev chi orthop. 42 246-267 Apr June, 1956.)

are kept in contact, a process of rehabilitation takes place, and the conjunctivovascular offshoots coming from the distal segment penetrate the head in a regularly progressive manner As this process develops however sequestra may form, and eventually a secondary deformation of the cotyledon and a true degenerative arthrosis of the hip

With these facts in mind the data obtained from a review

of 65 cases of traumatic necrosis of the head of the femur can be more easily understood The following observations in particular are useful as guides to the management of such cases (1) The frequency with which necrosis follows traumatic dislocation and its almost constant occurrence when reduction is delayed make it imperative to reduce all traumatic dislocations immediately and to complete the process by early screwing of the posterior cotyloid fragment if it is fairly large (2) Nailing with the Smith Petersen nail is still the best method of fixing subcapital fractures if it does not prevent necrosis it does at least reduce considerably the number of pseudarthroses A 20% incidence of necrosis after nailing does not justify the early use of acrylic prostheses with the accompanying danger of late deterioration because these prostheses deprive the patient of a 60% chance of recovering a normal hip (3) When necrosis is established given the uncertainty that still exists in regard to the efficacy of revitalization procedures the operative indications should be based on the functional status If it permits the patient to lead a nearly normal life, arthroplasty is not justified even though lesions appear in the radiographs If function is seriously impaired the choice lies between arthroplasty and arthrodesis Acrylic arthroplasty is apparently the best of these procedures and may be advised with the warning that in exchange for the preservation of mobility the patient incurs a 20% risk of a mediocre result or the possibility of late deterioration a danger not easily calculated in terms of percentage but a substantial one in a young person If the patient is young and active and has to lead a life in which standing and walking play a significant part he should accept arthrodesis In patients who are free from spinal lesions and whose other hip is sound, this procedure is not only definitive but gives extremely satisfactory results

Arthrodesis of the Hip in Children is difficult to obtain, and the percentage of failures is higher than in almost any other orthopedic operation This is due in part to the fact that injury to the growth centers of the proximal end of the femur must be avoided Attempts to obtain fusion of the hip in children by means of bone grafts placed in contact with

the ilium and femoral trochanter have resulted in many failures. Excising of the weight bearing articular cartilage and cortex of the femoral head and the acetabulum without dis articulation of the hip and through excision of the joint has not significantly altered the end result. Technics which

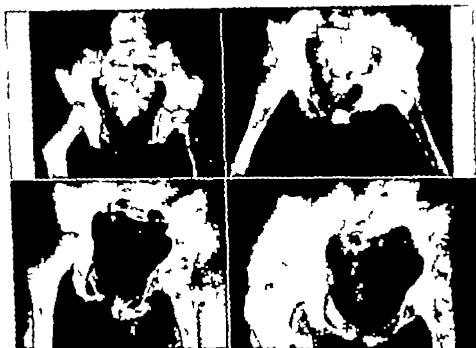


Fig. 136 (top left).—X-ray of boy, 9½, who had had intermittent limp and pain for three months and limitation of hip motion.
Fig. 137 (top right).—Iliac graft. Hip fusion. X-ray taken at first cast change (four months post fusion). Hip drainage was profuse.
Fig. 138 (bottom left).—X-ray 33 months post fusion. There had been cast protection for 14 months and drainage for 1 year. Bony trabeculation nearly complete.
Fig. 139 (bottom right).—Five years post fusion. Abduction 15 degrees, flexion 35 degrees, excellent gait, asymptomatic.
(Courtesy of Compere, E. L., and Thompson, R. G.: Quart. Bull. Northwestern Univ. M. School 29:335-342, Winter 1955.)

are used successfully on adult patients should never be used on young children.

Edward L. Compere and Robert G. Thompson[4] analyzed the results of attempts to fuse the hip in 28 children, 24 of whom had tuberculosis of the hip. Arthrodesis was successful following the first attempt in 14 of the 24 tuberculous patients. A bone graft from the greater trochanter and proximal end of the femur was used in 10 of the 14 patients

(4) Quart. Bull. Northwestern Univ. M. School 29:335-342, Winter 1955.

and an iliac bone graft in 4 (Figs 136-139) in 9, part of the articular cartilage and cortex was removed from the head of the femur and the acetabulum

Reoperation in 7 of the 10 patients with failures led to fusion in 5 A third operation was successful in one of the two remaining patients but in the other fusion failed after a fourth and fifth attempt.

Fusion did not occur in three of the four nontuberculous patients In all three instances, iliac bone was used and in one of these the articular cartilage and cortex were partly removed The one successful fusion followed a femoral trochanteric bone graft without excision of the joint

A re evaluation of the failures indicates that larger and stronger bone grafts well mortised into ilium and femur are most likely to be successful The bone graft from the ilium of a young child is thin flimsy and deficient in total amount. Removal of the autogenous trochanteric bone for a graft destroys *the trochanteric epiphyses therefore this is* not a wise procedure at least for the young child Autogenous tibial bone or strong cortical bone grafts from a bone bank *used in conjunction with thorough excision of articular car*tilage and cortex after disarticulation of the hip is the logical technic and one which has been successfully used

Arthrodesis of Hip Two Stage Method for Difficult Cases is described by LeRoy C Abbott and Donald B Lucas[5] (Univ of California) Arthrodesis of the hip joint is difficult to obtain in patients who show massive destruction of the femoral head and neck following disease or previous surgery and in whom ordinary methods of fusion fail A two stage method of arthrodesis in such patients developed previously has been modified by the authors

TECHNIC.—With the patient supine, a routine Smith-Petersen incision *is used to gain access to the hip joint. The capsule of the joint* is excised to expose the intracapsular structures. In patients with tuberculosis or sepsis a thorough debrid[illegible] of the joint is carried out, including removal of all acetab[illegible] cartilage. The remaining portion of the femoral neck [illegible] its base and the gluteal tendons are [illegible] from the [illegible] and adjacent area of the f[illegible] With a [illegible] the subchondral bone of the ac[illegible] ed [illegible] and posterior [illegible] cancello[illegible] sed.

(5) S. Clin. K[illegible] 1950 Aug[illegible]

of the acetabulum is deepened slightly to permit better seating of the greater trochanter

The greater trochanter is then denuded of cortical bone and placed in the acetabulum. In patients in whom the head and neck of the femur are intact, the neck is excised at its base and the head and neck discarded. With the foot in lateral rotation of about 5 10 degrees the thigh is flexed about 35 degrees and slowly abducted until the adductor muscles tighten. Amount of abduction obtained will depend on amount of contracture of the adductor muscles before operation. The trochanter should fit as snugly as possible into the acetabulum usu-

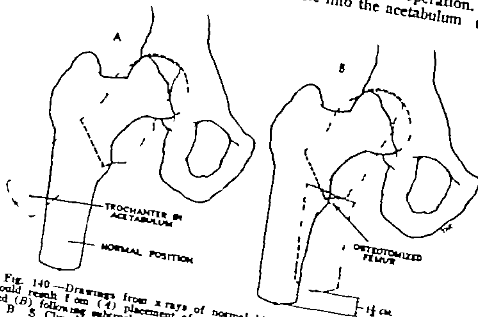


Fig. 140 —Drawings from x rays of normal hip show 1 5 cm. shortening which would result from (A) placement of greater trochanter in acetabulum in abduction and (B) following subtrochanteric osteotomy. (Courtesy of Abbott, L. C., and Lucas, D. B. S. Clin. North America 36 1033-1050 August, 1956.)

ally about 45 degrees of abduction is necessary before it becomes well impacted. To prevent ingrowth of fibrous tissue, any remaining space is packed with cancellous bone chips removed from the adjacent ilium. A bilateral hip spica cast is applied after closure extending to the toes on the involved side and to the knee on the uninvolved side. To insure that the trochanter has remained well seated in the acetabulum, routine x rays are made to check its position in plaster.

After six weeks of immobilization (longer in sepsis and tuberculosis) the cast is removed and the hip checked clinically and by x rays. If the fusion site is solid a transverse subtrochanteric osteotomy is carried out through the lower arm of the Smith Petersen incision. Osteotomy is done just distal to the lesser trochanter. The periosteum is elevated and the bone cut transversely across its entire shaft. The shaft is then adducted and displaced slightly inward.

Final positioning of the extremity depends on preference of the surgeon and patient.

The actual shortening which can result from this type of arthrodesis is about 1 5 cm (Fig 140) Extensive destruction of the acetabulum results in further shortening The total functional shortening depends far more on the degree of fixed flexion and abduction selected for the extremity This functional shortening will be the same in any method of fusion and will vary with positioning of the hip

Ischiofemoral Arthrodesis of Hip Successful arthrodesis of the hip joint can be achieved in many cases by iliofemoral grafting particularly when this procedure is combined with intra articular fusion and internal fixation Ischiofemoral arthrodesis is indicated if there is need to avoid diseased or avascular tissue and bone e.g in patients with extensive tuberculous involvement of the acetabulum ilium or femoral neck or in those with fibrosis and sclerosis following previous unsuccessful iliofemoral fusions

James B Jones Arthur J Driscoll Jr and Halford Hallock[6] (New York) reviewed 18 ischiofemoral arthrodeses, 13 of them done for tuberculosis and 5 for secondary osteoarthritis and found that graft fracture occurred in 39% of the patients Two factors appear to be significant in connection with this complication First the grafts are cortical in type It is probably necessary to use this type of bone to provide strength but revitalization of compact bone is known to be an extremely slow process If the grafts are to remain strong until completely revitalized they should be large and protected from strain for a long time Secondly ischiofemoral grafts even after they have become united at both ends are subjected to much stress in the presence of a mobile hip because they are placed in an eccentric position with relation to the center of motion of the joint Because intra articular fixation minimizes this deleterious stress subsequent development of fusion between the joint surfaces may well be a determining factor in the ultimate success of an extra articular arthrodesis If this factor is important then it would seem advisable whenever feasible, to combine intra articular with extra articular fusion or at least to confine the use of ischiofemoral grafts alone to pa

(6) J Bone & Joint Surg 38 A 1117 1125 October 1956.

tients (1) in whom the articular-cartilage barrier has been destroyed by previous suppurative arthritis (2) in whom the joint surfaces have been excised in a previous but unsuccessful iliofemoral fusion procedure or (3) in whom arthrodesis of the joint surfaces may be expected to occur spontaneously after extra articular fusion because of the tuberculous nature of the disease process

When ischiofemoral arthrodesis is indicated the Trumble method with Van Gorder s modifications is favored Since an osteotomy is an additional source of complications, it should be done only when necessary for correction of the deformity and performed through an open approach

Recurrent Dislocation of Hip unassociated with acetabular fracture congenital dysplasia sepsis or paralysis is rare



Fig 141 —Recurrent dislocation of left hip. Roentgenogram is typical of appearance of hip in each episode of dislocation. (Courtesy of Sullivan, C. R., et al : J Bone & Joint Surg 37 A 1266-1270, December 1955)

Before 1945 only seven such cases had been reported. C Roger Sullivan William H Bickel and Paul R. Lipscomb[7] (Mayo Clinic) present a case of this anomaly

Man 60 had had posterior dislocation of the left hip seven times within 17 years (Fig 141) The first two episodes were 10 years

(7) J Bone & Joint Surg 37 A 1266-1270 December 1955

apart. The cause in each instance was a fall. At no time was there fracture of the acetabulum, nor more than temporary paresthesia in the sciatic nerve distribution. Furthermore there was no avascular necrosis of the femoral head, and only minimal hypertrophic changes were evident around the hip joints despite repeated trauma.

The dislocation was treated by surgical reinforcement of the posterior superior supports of the hip with a bone block and by fascial repair of the capsule.

Osteotomy and Osteotomy Combined with Bone Grafting for Nonunion Following Fracture of Femoral Neck. Marcus J Stewart and R. E Wells[8] (Univ of Tennessee) treated 112 ununited fractures of the neck of the femur In 100 hips, osteotomy was the primary procedure with high displacement osteotomy performed in 74 patients low angulation osteotomy (Figs 142 144) in 18, high angulation osteotomy in 5 low displacement osteotomy in 2 and intertrochanteric rotational osteotomy in 1 Average length of time from date of fracture of the femoral neck until time of osteotomy was 10½ months Percentagewise the best results were achieved with the low angulation osteotomy the incidence of nonunion being the lowest with this type.

In an attempt to preserve circulation in the head of the femur or to restore it to the extent that advanced degenerative arthritic changes and avascular necrosis would not develop osteotomy combined with bone grafting and internal fixation was done on 12 patients (average age 60) In this procedure osteotomy can be used to correct the faulty mechanics caused by the varus position of the hip The rotational and shearing forces at the fracture site are converted into impacting forces Sufficient internal fixation eliminates the necessity of plaster of paris or of any form of external support Cortical bone grafts extending from the osteotomy site across the neck into the central or lower part of the head of the femur give the best results The procedure hastens development of a new channel of blood to the capital portion of the femur In these 12 patients all osteotomy fragments and neck fractures united pain disappeared in 9 and in 11 shortening of the extremity was less than 1 in. Three of seven patients with moderate to marked avascular sclerosis of the head of the femur before operation exhibited

(8) J Bone & Joint Surg 38-A:33-49 January 1956.



Fig 142 (top left) — Appearance of hip after performance of low angulation osteotomy

Fig 143 (top right) — Lateral view

Fig 144 (bottom) — Final anteroposterior and lateral x rays. Fixation of hip has been obtained by Blount Moe technic

(Courtesy of Stewart, M J and Wells, R E. J Bone & Joint Surg. 38-A:33-49 January 1956.)

no change whereas four showed definite improvement after surgery

► [For the patient who is under 70 and whose cardiac and renal status is satisfactory with a femoral head which appears to be viable, osteotomy combined with bone grafting is certainly the procedure of choice. For the very poorest risk patient for whom any prolonged recumbency is inadvisable, and for the patient who is over 70 some procedure which would make weight bearing activities possible in a short time is preferable. For all patients who have a necrotic and degenerating femoral head, removal of the head and substitution of a metallic prosthesis would be my choice of procedure.—Ed.]

Internal Fixation in Displaced Intracapsular Fractures of the Femoral Neck. Nonunion of the femoral neck following

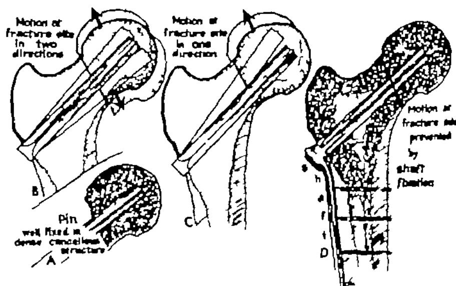


Fig. 145.—Drawings A, B and C illustrate the marked instability of the straight nail. D shows motion at the fracture site prevented by shaft fixation of nail plate. (Courtesy of Eaton, G. O.: J. Bone & Joint Surg. 38-A:23-32, January, 1956.)

fracture may be due to lack of immobilization. The femoral neck requires complete immobilization because of its comparatively precarious circulation. Haboush has shown that to immobilize the femur a nail plate should be inserted in the low position so that it rests on the calcar femorale distal to the point of fracture (Fig. 145). To lower the percentage of poor results following the insertion of a Smith-Petersen nail George O. Eaton[9] (Baltimore) used a nail plate for displaced femoral head and neck fractures in 36 patients. Of 20

(9) J. Bone & Joint Surg. 38-A:23-32, January, 1956.

patients who had a long enough follow up period 18 had clinical union of the fragments while in 2 patients the nail plates were removed because of septicemia and because they extruded from the femoral head Standard methods of manipulative reduction were used attempting to get slight over reduction so as to obtain a valgus position of the head if possible The nailing was done under x ray control In two patients the nail became disengaged from the head and re nailing had to be done weeks later the patients were put in plaster spica casts for six weeks (the spica seems to give additional support in patients in whom the limb is heavy or the bone texture soft) Except for these two patients no additional immobilization was employed Motion but no weight bearing was allowed Weight bearing was usually permitted after a 12 week check x ray had been made. Protrusion of the nail through the head and into the acetabulum in the postoperative healing period did not occur to an objectionable degree

► [Treatment of the recent intracapsular displaced fracture of the femoral neck will be successful if the fracture is sufficiently over reduced to create slight valgus between the head and the neck fragments with the fracture margin of the neck fragment sufficiently displaced medially to permit the inferior fracture margin of the proximal or head fragment to come to rest inside the cortical area of the neck fragment. This will permit impaction, rather than displacement, from weight stress on the head fragment. This principle has been repeatedly pointed out by McElvenny whose percentage of healing of fractures of this type is the highest of anyone whose cases I have observed. If a reduction of this type cannot be obtained, an osteotomy is indicated at the time of initial treatment of this fracture.—Ed.]

Intraosseous Venographies of Medial Fractures of Femoral Neck Residual Vascularity of Head Fragment in Different Types of Fractures and Its Relation to Prognosis The femoral head is supplied by branches of the medial femoral circumflex artery and the obturator artery The supply is characterized by the prolonged intra articular course of the vessels which are easily exposed to damage Below and medially the head has a metaphysial part which is supplied by the inferior retinacular vessels The larger epiphysial part is supplied by the superior retinacular and the foveolar vessels

Lateral fractures course laterally to the medial circumflex vessel and medial fractures course medially to it. In the former the vessel and its branches remain on the central

fragment while in the medial fractures (Figs 146 and 147) the branches must bridge the fracture split in remnants of the synovial membrane The medial fractures are subdivided according to degree of displacement. In valgus fractures the retinacular vessels have a good chance of remaining intact. In varus fractures displacement often causes damage to the most important vessels i e the superior retinacular vessels



Fig 146 (left) —Postmortem arteriography of medial fracture in woman 85 who died fi weeks fter operation. Medial circumflex artery situat d on distal fragment. Arrow indicates fractur line.
Fig 147 (right) —Same specimen fter decalcificat on. Only small vessel extends beyond fracture line
(Courtesy of Hulth, A Acta chi scandinav supp. 214 1956)

which course through the zone where the greatest diastasis arises in the fracture

Anders Hulth[1] (Uppsala) found that intraosseous venography of the femoral head helps to assess the vascular supply in different types of fractures of the neck. In positive venography the veins are visualized while in negative venography there is no vascular filling In order to obtain a filling of the veins of the head in the retinacula and ligamentum teres the contrast must be prevented from flowing into the neck This requirement is only filled in medial fractures of the neck with an actual fracture split and epiphyse-

(1) Acta chi scandinav supp. 214 1956.

olysis where the disk of epiphysial cartilage prevents the downward flow of contrast into the neck (Fig 148) To prevent damage from the contrast material, the smallest possible amount of contrast should be injected Hulth found no form of serious displacement which constantly caused avas



Fig 148.—Positive venography (circumflex) demonstrating inferior retinacular medial circumflex and femoral veins in woman, 70 with varus fracture. Contrast medium 2 5 ml. 50% umbradil for 18 seconds. (Courtesy of Hulth A. Acta chir scandinav supp 214 1956)

cularity for in addition to ligamentum teres the inferior retinaculum may also remain intact even in cases of very pronounced displacement

A follow up study on 45 patients with positive or negative venographies revealed that necrosis developed in all patients with negative venography and in one third with positive venography However the necrosis differed in the two groups

Total avascularity in a head fragment is primarily manifested in the fracture region itself changes in the fracture position or resorption of the distal part of the head occur with ploughing or penetration of the nail respectively as a result Partial avascularity usually results in infraction of the upper part of the head after healing of the fracture. Teres vascularization of a head fragment may alone, be sufficient for survival of the fragment and healing of the fracture The blood supply of the head fragment is decisively important in the healing of the neck fracture after osteosynthesis Healing occurs without concomitant resorptive phenomena. No instance of distal resorption of the head or penetration by the nail occurred among the positive venographies Valgus fractures with an avascular head fragment heal normally However varus fracture with avascular head fragments tend to heal poorly

In positive venographies common methods of osteosynthesis yield good results A prolonged period of no weight bearing is preferred In negative venographies considerably better stability is required than that afforded by the usual nailing methods in order to obtain certain healing of the fracture Primary application of a head prosthesis in cases of negative venography may be used especially in older patients

Experiences with Lengthening of Femur over Intramedullary Rod are described by Frederic C Bost and Loren J Larsen[2] (San Francisco) who used the rod to control alinement of the osteotomized fragments in 23 operations performed on 20 children for lengthening of the femur and found it eminently satisfactory eliminating many difficulties formerly encountered In addition to the conventional osteotomies by step-cut or oblique section a transverse osteotomy was performed

The two methods employed to apply the traction and countertraction necessary for lengthening of the femur after the operation were traction on the limb which is suspended in a Thomas splint and the use of a traction-countertraction apparatus (Fig 149) Primary union of the bone fragments occurred as readily after a transverse osteotomy as after the

(2) J Bone & Joint S rg 38-A 567 584 June, 1956.

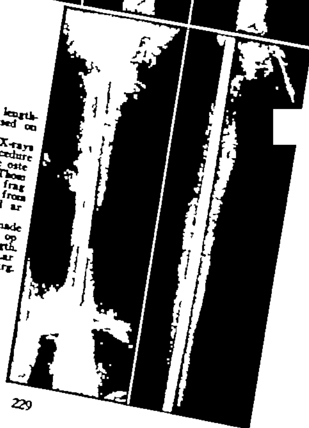


Fig. 149 (above).—Femoral lengthening distraction apparatus used on some patients in this series.

Fig. 150 (above right).—X-rays made during lengthening procedure 9, 16 and 21 days after oblique osteotomy. Intramedullary rod and Thom as splint control alinement of fragments. Shortening had resulted from tuberculous arthritis of hip and arthrodesis.

Fig. 151 (right).—X-rays made three months and one year after operation, showing 2 in. gain in length. (Courtesy of Bost, F. C., and Larsen, L. J.: J. Bone & Joint Surg. 38-A: 567-584, June, 1956.)

other types of osteotomy which provide for contact of the bone fragments throughout the lengthening procedure This fact indicated that during its growth the bone callus may be stretched out in length (Figs 150 and 151)

Delayed union of the bone occurred frequently Its cause could not be determined nor was the best time found for starting the lengthening procedure after osteotomy It would appear that the more the bone is lengthened the longer the time required for union of the fragments and the more likelihood of nonunion

Acquired shortening responded more readily to the lengthening procedure than did that resulting from a congenital failure of the growth of the limb It may be concluded in the latter instance, that the soft tissues are structurally adapted to the shortened bone and therefore less elastic than those in the limb which has become shortened because of an acquired disturbance of its growth

While the intramedullary rod and the transverse osteotomy have simplified the operation this method has not influenced occurrence of complications resulting from resistance of soft tissues and stretching of vessels and nerves of the thigh

Treatment of Lesions of Semilunar Cartilages is reported by Bent Barfod and Franz Bierring[3] (Roskilde, Denmark) Only lesions involving the peripheral vascularized portion of a meniscus i e nondislocated avulsions from the joint capsule have a theoretical possibility of healing under conservative treatment. This rare type lesion cannot be distinguished clinically from the others and routine conservative treatment delays performance of an operation which is usually necessary As arthrosis is presumably caused by repeated locking and exudation in the joint rather than by the operation a more active procedure is recommended Conservative treatment should be used only when the diagnosis is doubtful

The authors performed meniscectomy for lesions of the semilunar cartilages of the knee joint in 88 men and 24 women 98% were followed Results were good in 81% distinctly improved in 13% and poor in 6% Except that the

(3) Acta chir scandinav 110 423-435 1956.

number of patients in whom improvement only' was achieved increased with a history of over five years results were independent of duration of history frequency of attacks of locking and age at operation Poor late results were chiefly due to arthrosis Arthrosis at the time of operation occurred oftener in patients over 40 and with a history of over six months After surgery 68% returned to work within six weeks and 88% within three months

Early operation is recommended because of shorter treatment period and better results

Symptoms and Functional Origin of Periostoses of Medial Tibial Crest were studied by H T Nitz and W Presber[4] (Berlin) because of high incidence in athletes and difficulty of treating it Among 829 athletes 43 had pain between the middle and lower thirds of the shin bone Symptoms were most frequent in runners jumpers and volley- and basketball players In some walking also caused pain and all showed pain on pressure usually most severe on the posteromedial tibial crest Palpation sometimes elicited one, sometimes two painful points with an area of less intense pain above and below Moderate to severe swelling of deep connective tissue layers near or behind the posterior inner tibial crest could usually be felt. In acute cases and usually later x rays of the tibia were negative, but in some cases of long duration periosteal deposits were revealed

General consensus is that this type tibial pain is due to traction on the muscles at the point of attachment but the authors suggest that it may also be due to traction on the fasciae caused by increased volume of surrounding muscles Persons with a high instep apparently are particularly susceptible possibly because of the relatively short lever provided by the muscles of the heel

Heat and massage or radiation by diathermy or ultrasound with rest and injections of procaine had no effect. In patients with early cases i e within 8 days after onset of symptoms rapid and lasting results were usually obtained by application of an elastic bandage reinforced with Leukoplast, to the foot for about 14 days Diathermy was given simultaneously After 10-12 days (symptoms usually disap-

(4) Deutsche med. Wchnschr 80 1538-1542, Oct. 21 1955

peared within 8 days) training was cautiously resumed with the bandage still in place The bandage was removed after 14 days In one patient recurrence some weeks later was quickly controlled with the same management Results were less satisfactory in patients with symptoms of long duration who required elastic bandages for a long period though training was resumed with caution while the bandage was still on

Congenital Pseudoarthrosis of Tibia Treated by Intramedullary Nail is reported by John Charnley[5] (Royal In-



Fig. 152 (above) —Anteroposterior and lateral views after massive graft from opposite tibia was inserted into medulla of distal fragment and screwed to surface of proximal fragment.

Fig 153 (right) —Lateral and anteroposterior views 4½ years after operation. (Courtesy of Charnley J J Bone & Joint Surg 38-A 283 290 April, 1956.)

firm Manchester) who treated two girls by intramedullary nailing and application of thin osteoperiosteal grafts Surgery was successful in both patients as judged by five year results (Figs 152 and 153) The essential feature of the method is mechanical as all angulatory strains are converted into longitudinal compression forces The grafts used were

(5) J Bone & Joint Surg. 38-A 283-290, April, 1956.

relatively unsubstantial and only adjuvant to the nail Important details of the technic are (1) the distal end of the nail should be blunt to prevent spontaneous extrusion through the sole of the foot (2) the nail should be passed through the anterior aspect of the lower end of the tibia so as to traverse the tarsus in the region of the neck of the talus and avoid penetrating the ankle joint and (3) at the time of operation the distal end of the nail should reside in the tarsus making it impossible for it to cut out of the distal fragment of the tibia The intramedullary nail should remain in situ permanently or as many years as necessary for the tibia to hypertrophy fully

► [I have used the intramedullary rod to maintain alinement and to prevent anterior bowing, in combination with bone grafts in treatment of congenital pseudarthrosis of the tibia. The intramedullary rod used for my patients was introduced through the sole of the foot upward through the os calcis, astragalus across the ankle joint and up through the tibial fragments. This has maintained perfect alinement. After removal of the rod, ankle joint motion was restored and growth of the tibia has continued at about the same rate as that of the other tibia.—Ed.]

Residual Disability Following Acute Ankle Sprains William Riley Bosien O Sherwin Staples and Stuart W Russell[6] (Hitchcock Clinic and Found Hanover N.H) made follow up examinations on 113 young adults with 133 ankle sprains The mean time between acute injury and follow up examination was 29 months A history of previous ankle sprain was given by 48 (42%)

At follow up 37 (33%) showed residual ankle symptoms and 68 (60%) abnormal physical findings The symptoms varied from occasional recurrent sprains on strenuous activity to instability of the ankle on walking especially on loose stones or uneven ground The same patients had varying degrees of pain ordinarily not severe

Over two thirds of the patients had changes in ankle joint motion most changes being increases in range of motion particularly in inversion and eversion Abnormal lateral and rotatory mobility of the talus in the ankle joint mortise was present in 55 patients (41%) X rays showed no evidence of past or present fracture The only statistically significant factor among patients with chronic ankle symptoms was high incidence of peroneal muscle weakness

(6) J Bone & Joint Surg. 37 A 1237 1242, December 1955

Mechanism of Ankle Injuries was studied by Barnard Kleiger[7] (Hosp for Joint Diseases New York) who found that simple anteroposterior lateral and oblique x rays are not adequate for study of an ankle injury They demonstrate bone injury but may not show ligament injury Adequate x ray study requires a view while stress is applied to the

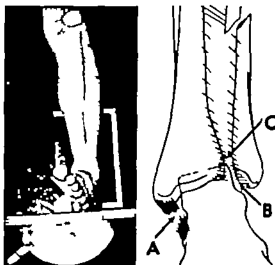


Fig. 154 (left) —Heel is kept in inversion by angulating foot holder foot being held at 90 degrees with relation to long axis of leg

Fig. 155 (right) —When foot is forced into lateral rotation (*A*) anterior talotibial fibers of deltoid may be ruptured and talus strikes anterior of distal end of fibula. (*B*) Posterior talofibular ligament pulls on distal end of fibula, placing tension on antero-inferior, posteroinferior and inferior transverse tibiofibular ligaments in sequence. (*C*) When these ligaments have given way and talus moves laterally tension is placed on interosseous ligament and membrane. When these tear tibiofibular syndesmosis is disrupted.

(Courtesy of Kleiger B. J Bone & Joint Surg 38-A 59-70 January 1956.)

foot in lateral rotation and another in inversion to demonstrate ligament injury

Technic.—The foot is strapped in a plastic foot holder and an anteroposterior x ray made. With the foot strapped in the vertical position the patient lies on the uninjured side. Thus the leg is rotated medialward in relation to the foot, the foot remaining fixed and laterally rotated in relation to the leg and another x ray is made without changing the position of the x ray tube. The foot holder is turned to a position of inversion and another anteroposterior view made (Fig 154) Finally a true lateral view is made.

By comparing x rays made in the neutral position without stress with those made with the foot in varying posi

(7) J Bone & Joint Surg 38-A 59-70 January 1956.

tions under stress instability can be demonstrated Stress on the foot in lateral rotation produces lateral ankle instability with or without diastasis and eversion instability Inversion stress demonstrates inversion instability With this technic even minor degrees of instability can be determined by measuring the width of the joint space at the site of instability and comparing it with the width of the rest of the joint space Ordinarily anesthesia is not needed for stress x rays when they are made without anesthesia even slight instability is significant because the range of abnormal mobility is less When swelling or muscle spasm prevents application of stress local or general anesthesia may be used Oblique views are made only when previous views show pathologic changes in the bone that would be more clearly demonstrated

Injuries of the ankle are most often caused by forces in a lateral direction viz lateral rotation and eversion Lateral rotation of the foot, or medial rotation of the leg when the foot is fixed (Fig 155) is most often the cause of ankle injury Normally the talus is held firmly by the malleoli and the ligaments and cannot rotate medially or laterally when the foot is held at 90 degrees but with sufficient force, it rotates laterally to tear the medial portion of the capsule and anterior talotibial fibers of the deltoid ligament The lateral surface of the talus strikes the anterior aspect of the fibular malleolus while simultaneously the fibular malleolus is pulled posteriorly by the talofibular ligament This maneuver tears the antero- and posteroinferior tibiofibular ligaments and the inferior transverse ligament the interosseous ligament and the interosseous membrane in sequence One or all of these ligaments may be torn whether or not fracture occurs

Eversion is not as common as lateral rotation When the heel is everted tension is put on the deltoid ligament and it may tear or pull off the tibial malleolus Inversion of the heel often injures the anterior and posterior talofibular ligaments and the calcaneofibular ligament of the ankle

Posterior Arthrodesis of Ankle and Subtalar Joints is reported by O Sherwin Staples[8] (Mary Hitchcock Mem'l

(8) J Bone & Joint Surg 38-A 50-58 January 1956.

Hosp Hanover N H) who modified Campbell s technic as follows

TECHNIC.—With the patient prone, an incision of about 12 cm. is made posteriorly along the medial border of the tendo achillis from the superior aspect of the calcaneus proximally The Achilles tendon is sectioned by a Z tenotomy in the frontal plane, the fascia of the flexor hallucis longus muscle opened longitudinally and the muscle reflected medially to expose the posterior aspect of the tibiotalar and

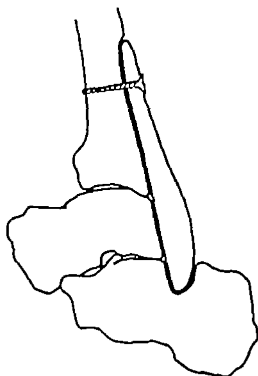


Fig 156 —Posterior arthrodesis f ankle and subtalar joints. (Courtesy of Staples, O S. J Bone & Joint Surg. 38-A 50 56 January 1956.)

talocalcaneal joints These joints are opened by transverse incisions and the cartilage removed from the posterior portions of the joints. As shown in Figure 156 the tibia is osteotomized along the posterior aspect, including the posterior lip of the distal end of that bone, but care must be taken to avoid the medial malleolus. The osteotomy extends across the posterior aspect of the talus in the same plane, the foot being held in the predetermined position and ends distally in an excavation 1 cm deep in the superior aspect of the posterior portion of the calcaneus

The calcaneus excavation should be about 1 cm. in the anteroposterior diameter and 2.5 cm. in the transverse diameter A graft of cortical and cancellous bone 7.5-10 cm. long 2.5 cm. wide and 1 cm.

thick, is taken from the posterior aspect of the ilium near the posterior superior spine. The graft is fitted to the osteotomized surface of the tibia, talus and calcaneus the cancellous side facing the osteotomized surface. After the joint spaces are packed with cancellous chips the graft is wedged into the hole in the calcaneus and fastened to the tibia by a Vitallium screw which holds the graft in good contact with the osteotomy surface and provides fairly good stability of the fusion area, though forced dorsiflexion is to be avoided. After wound closure, a plaster cast is applied from toes to groin while the foot is held in the position desired for fusion, usually 5 10 degrees of



Fig 157 (left) —Posterior arthrodesis of right ankle and subtalar joints 3½ years after operation.
Fig. 158 (right) —Anterior arthrodesis of left ankle joint 3½ years after operation. (Courtesy J Staples, O S J Bone & Joint Surg. 38-A 50-58 January 1956.)

plantar flexion and in the neutral position or a few degrees of valgus in the coronary plane The knee is held in about 30 degrees of flexion. This type cast is used for two to three months until x rays reveal early union, when a short cast may be used until healing is solid.

The advantages of posterior fusion are a simple surgical approach the long distal surface of the talus and calcaneus provided to receive a graft and the ease with which the talocalcaneal joint may be included in the fusion area. When the talocalcaneal joint is normal the method is ordinarily not applicable as preservation of the motion of this joint is desirable from the functional standpoint because it adds to the motion remaining in the tarsal region

The method can be applied when the talocalcaneal and

tibiotalar joints are destroyed by injury Figures 157 and 158 illustrate the effectiveness of the procedure.

► [The procedure described is sound and practical. Incidence of failure in attempted ankle joint fusion should be greatly reduced by use of this method of posterior arthrodesis.—Ed.]

AMPUTATIONS AND PROSTHESES

Status of Refrigeration for Amputations and for Tissue Preservation Lyman Weeks Crossman[9] (Baytown Tex) states that shockless amputations under refrigeration anesthesia are desirable for all patients not merely those considered poor risks Refrigeration anesthesia is advantageous because it avoids shock controls intoxications and avoids anesthetic accidents Preliminary packing of the limb in ice for one to three days controls intoxication of infectious gangrene better than any antibiotic.

TECHNIC.—After barbiturate administration and use of a tourniquet around the thigh the leg is buried from the toes to near the groin in about 75 lb finely chopped ice and wrapped in a rubber sheet. Occasionally the tourniquet can be omitted, especially in advanced arteriosclerosis. The leg is removed from the ice when the surgeon is ready to operate and the skin is then dried and prepared as usual. The amputation is performed and after visible vessels are ligated and the wound is ready for closure, the tourniquet is removed and all bleeding vessels are tied After the wound is closed, it is covered with a few thin pieces of gauze and ice bags are placed around it for 24-48 hours to control pain and edema. Infection or doubtful tissue vitality may be reasons for continuing the cooling longer

Refrigeration can also be used for tissue preservation in partial amputation of a digit or limb or to preserve badly damaged tissues which cannot be treated surgically immediately It is an excellent method of treating burns because it can simultaneously inhibit pain shock infection and tissue devitalization Burns are sufficiently superficial to make the treatment applicable to any part of the body not merely the limbs The best emergency treatment is to plunge the burned part immediately into ice water or the coldest water obtainable This reduces the pain and subsequent inflammation or necrosis The area should be dressed with a single layer of petrolatum gauze which can be changed daily

(9) Am. J Surg 91 92-98, January 1956

without pain and ice or a refrigerating applicator at ice temperature should be used Duration of hypothermia is measured by severity of the burn, ranging from a few hours for a minor burn to several weeks if needed The burn should not be scrubbed or debrided Antibiotics may be used but are not necessary If salt is not added to ice, the refrigeration can never cause frostbite because the tissues are not frozen and always retain soft consistency Immersion foot does not occur The only dangers of refrigeration therapy for burns are sloughs due to pressure and too long continuance of too low temperature Temperature should be kept as high as possible but as low as necessary

Treatment of Large Nerves at Time of Amputation of Extremity Probable Cause for Persistent Pain According to Louis G Herrmann and Claude G Bollack[1] (Univ of Cincinnati) the management of large mixed nerves at the time of amputation of an extremity is of real importance in reducing the incidence and severity of persistent pain in the stump

Irritation of centrally conducting axons by local inflammation excess scar formation or the uninhibited proliferation of neuraxons forming neuromas at the end of the nerve may give rise to persistent pain in the stump or in the phantom limb for many months or years after the amputation of the part The application of a nonabsorbable ligature about the uninjured large nerve trunk at a point about 1 in above the end of the amputation constitutes a simple and physiologic means of sealing off the end of the nerve and preventing the formation of a neuroma The ligature however must be tied down gently to prevent rupture of the epineurium

Further reduction of the incidence of persistent or phantom limb pain after amputation of an extremity can be accomplished by the careful injection of 1 cc of 5% formaldehyde solution into the proximal end of the mixed nerve immediately before the application of the nonabsorbable ligature

Report of Experiences with Heidelberg Pneumatic Arm Prosthesis (1949-54) After follow up of 24 patients using this appliance (table) A Hopf and E. Reinhardt[2] (Univ of

(1) Am. Surgeon 22:696-704 August, 1956.
(2) Arch. orthop. u Unfall—Chir 48:103-114 1956.

REPORT OF PATIENTS USING HEIDELBERG PNEUMATIC ARM PROSTHESIS

Age	Former and Present Occup tions	Result of Injury	Prosthesis Applied D te and Type	Remarks
			Without Arms	
50	Builder Consulting engineer	Shoulder exarticulation, bilateral	June 1954 Exarticular right	Content with prosthesis function can eat, drink, grasp securely write well no complaints; does not want to be without prosthesis
21	Unemployed Messenger	Without arms since birth	August 1953 Exarticular right	Apparently content; can eat, grasp and write a little; otherwise has no function; leaky gas line at times; upper arm too long; born without arms; is clever with feet has difficulty learning function of prosthesis; intelligence below average
			Double Upper Arm Amputees	
14	Student	Upper arm amputation, bilateral	Jun 1954 Upper arm, right	Content can eat, grasp, write moderately well; cannot drink; rubber bag not tight; other prosthetic appliances unsuccessful not content with 3 previous artificial arms
23	Dispatcher Messenger	Upper arm amputation, bilateral	November 1949 Upper arm, right	Prosthesis worn 4 weeks, then became ill writes with mouth, only partial grip al tube leaky; valve at knee; gas flask in pocket; elbow joint too angular, "If I could afford it, I d get a prosthetic appliance for the left side because the condition of the stump is better"
35	Postal department employee Mail guard	Upper arm amputation, bilateral (short stump)	October 1954 Upper arm, right	Happy (after becoming accustomed) can eat, drink, grasp, write; no complaints; so far no defects noted
22	Butcher Doorkeeper	Exarticulation, right; upper arm amputation, left	M y 1953 Upper arm, left	Happy; "first class, can only express praise" can eat, drink, grasp and write well; no complaints
			Upper and Lower Arm Amputees	
20	Electrician Office worker	Upper arm amputation, right; lower arm amputation, left	March 1954 Lower arm, left	Content can eat, drink, grasp, writ ; no complaints
37	Police official Doorkeeper	Upper arm amputation, right; lower arm amputation, left	May 1952 Lower arm, left	Content; "without it, employment would be impossible ; can eat drink, grasp write, repair requires long time; greater wea on adjustment pin, rubber tubes and glove
29	Electrician Unemployed	Upper arm amputation, right; lower arm amputation, left	September 1952 Upper arm, right	Fairly content; can eat, grasp, write, but not drink; uses prosthesis for eating only; no special compla nts

Report of Patients Using Heidelberg Pneumatic Arm Prosthesis (*Cont*)

Age	Former and Present Occupations	Result of Injury	Prosthesis Applied Date and Type	Remarks
			Double Lower Arm Amputees	
42	Professional soldier Agent	Lower arm amputation, bilateral right Krukenberg	July 1954 Lower arm, left (earlier Hüfner arm, left, Flecher hand, right)	Conditionally satisfied, since prosthesis used at home only; can drink, grasp average objects; cannot eat; if carbonic acid flask were situated in some other place, prosthesis would be outstanding in his opinion
43	Electrician Comptroller	Lower arm amputation, bilateral	November 1949 October 1952 May 1955 Lower arm, both sides	Content; can eat, drink, perform necessary acts; do light work; write; repeated change of tubes formerly necessary; gloves wear out too soon
35	Soldier Mayor	Lower arm amputation, bilateral	November 1949 Lower arm, right	Has worn pneumatic prosthesis as experiment only; prefers Flecher hand; pneumatic prosthesis too slow and does not permit acceleration of movement.
			Unilateral Amputees with Maiming of Other Arm	
35	House painter Invalid	Lower arm amputation, left; extensive damage to right hand	October 1952 Lower arm, left	Dissatisfied; cannot manage mechanism; can grasp only medium-sized and small objects; complains of the weight; intelligence far under normal
24	Servant girl Housewife	Lower arm amputation left; injury of right hand	May 1954 Lower arm, left	Dissatisfied; cannot manipulate mechanism; can grasp only small objects, and with difficulty; prosthesis too heavy in bad position, and must "fill it every 30 minutes"; doesn't take trouble to manage it
			Upper Arm Amputees	
17	Painter Rehabilitation	Upper arm amputation, right	October 1953 Upper arm, right	Satisfied; can grasp, eat well; writing done with good hand; pull on shoulder troublesome; wishes a light cosmetic arm as change; no complaints
24	Instrument maker Makes appointments for salesmen	Upper arm amputation, left (very short stump)	November 1953 Upper arm, left, with a shoulder cap	Satisfied; can eat relatively well, grasp medium-sized and small objects and carry heavy objects; no complaints, except long wait for delivery of new carbonic acid flask
39	Household helper Housewife	Upper arm amputation left	April 1954 Upper arm, left	Well satisfied; can carry everything, knit and do garden work; thumb not stable enough; should be provided with stronger iron; carbonic acid flask doesn't work at times

(*Cont.*)

Report of Patients Using Heidelberg Pneumatic Arm Prosthesis (*Cont*)

Age	Former and Present Occupations	Result of Injury	Prosthesis Applied Date and Type	Remarks
			Upper Arm Amputees (*Cont*)	
31	Farmer Agent	Upper arm amputation, right	July 1951 Upper arm, right	Content; can eat, drink with mug grasp medium-sized and small objects and write well complains of frequent repair for rubber bag and glove; prosthesis could be lighter; air tubes and air bag wear out too soon
20	Housewife	Upper arm amputation, right	October 1952 Upper arm, right	Content; wears prosthesis for cosmetic effect and light tasks only; harness troublesome and would be impossible to put on without outside help; color of arm and hand not natural; very interested in improvements
			Lower Arm Amputees	
25	Fine mechanic apprentice Architect	Lower arm amputation, left	October 1952 Lower arm left	Prosthesis preferable, "certainly the best arm prosthesis" can do almost all grasping tasks; prosthesis somewhat heavy; not dependent on prosthesis in work, but can aid, photograph, carry objects, open doors, so right hand is free; would like to see wider distribution of prostheses for poor
24	Shopkeeper s helper Doorkeeper	Lower arm amputation, right	November 1949 Lower arm, right	Content; limited manipulation of prosthesis; no complaints
24	Ticket supplier Timekeeper	Lower arm amputation, right	April 1950 Lower arm, right	Satisfied with prosthesis but dissatisfied with carbonic acid apparatus; frequent painf l situations because f valve not working properly and leaky tubes; carbonic acid apparatus broke down, therefore wears G prosthesis as cosmetic arm only; can grasp medium-sized and small objects and write form of hand satisfactory
27	Electrician helper Unemployed (formerly houseman)	Lower arm amputation, right	July 1949 Lower arm, right	Dissatisfied; does not use prosthesis; wears working arm; complains about valve conduction and refill flask prosthesis too troublesome; aluminum cuff too short; grasps only small and medium-sized objects; other tasks done with left hand
			Paralysis f Arm	
13	Student	Left arm paralyzed (Infantile paralysis)	September 1953 Pneumatic exercise apparatus, left arm	F irly content; can grasp medium and small objects; for free movements, prosthesis obstructive and constraining; no complaints since prosthesis l seldom used

Heidelberg) concluded there is at present no better prosthetic device for those with loss of both arms or shoulder exarticulation as well as for unilateral upper and lower arm amputees Developmental work on the prosthesis is now complete Technical defects which during the first years gave rise to complaints and abandonment of the prosthesis were due partly to lack of experience and partly to use of inappropriate materials in its construction Superiority of the pneumatic system consists of its low cost easy procurement and replenishment of fuel (easily available carbonic acid) wide functional mobility of most joints with the least energy output and in the certainty of joint regulation (once established) without further waste of fuel or muscular energy

A unique characteristic of the prosthesis is its extraordinary power in grasping and holding objects and conversely its capacity for fine movements within a motility range that approaches the physiologic in exactitude and flexibility Only the pneumatic system has these characteristics Hence it excels the self exhausting energy of other outside powered prostheses (e g the electric hand) and is definitely preferable to active prostheses systems that require relatively great muscular activity and can manipulate only a few joints in a useful way functionally Despite its complex mechanism the need for repair does not exceed the usual requirements of arm prostheses

Upper Extremity Prostheses in Juvenile Amputees Claude N Lambert[3] (Univ of Illinois) studied 60 patients under age 20 with 67 amputations Prostheses were prescribed and fitted for 43 and adequate training in the use of them was given All but three prostheses were equipped with a voluntary opening hook as the terminal device (Fig 159) Hands designed by the Army Prosthetics Research Laboratory were not used because small hands are not available and because of their high cost. In one instance only did the parents object to the child having a hook as the terminal device There was no history of injury to others caused by the hook The child who is fitted with a prosthesis early in life grows up with it and seemingly so do his playmates They regard the prosthesis as a part of the child and pay

(3) J Bone & Joint Surg. 38-A 421-426, April, 1956.

little attention to it Only two instances of broken prostheses were reported in the series Probably at least some part of the prosthesis will have to be replaced every two years.

Most of the congenital type of amputations require either no surgery or minimal surgery Occasionally, a small underdeveloped digit or 'bud may be removed for better fitting

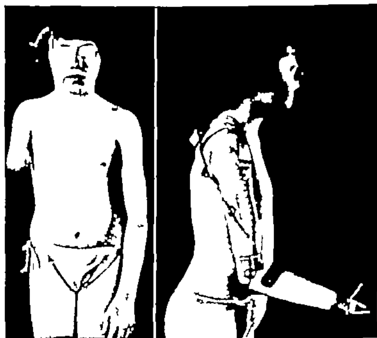


Fig 159—Typical above-elbow prosthesis. (Courtesy of Lambert, C. N : J Bone & Joint Surg. 38-A 421-426, April, 1956)

of the prosthesis but in no instance was reamputation at a higher level necessary

Exoskeletal Splithook Prostheses for Patients with Traumatic Tetraplegia Preliminary Experience with Their Use for Upper Extremities Roy H Nyquist[4] (Univ of Southern California) tried various splithook prostheses on 25 patients Only one rejected the device.

The splithooks are made of aluminum with neoprene inserts that permit good gripping because neoprene does not absorb grease or oil The operating mechanism of the Dorrance 555 model is simplest it requires no maintenance and has a jaw-opening wide enough for grasping large glasses.

(4) J A.M.A 160 761 763 Ma 3 1956.

If wrist extensors and elbow flexors are not of normal strength the combined weight of splithook and attached hand device prevents use of the appliance For patients with adequate strength to manipulate the heavier models the



Fig. 160 (top) —Use of cuff on right arm in place of right shoulder loop.
Fig. 161 (bottom) —Left-handed splithook mounted on hand device for right hand. Knob near base of movable lever can be set to put springs on light or heavy load. (Courtesy of Nyquist, R. H.: J.A.M.A. 160:761 763 Mar 3 1956.)

strong grip of the Northrup and Army Prosthetics Research Laboratory splithooks is preferable.

The selected splithook must be properly fitted to a hand device of stainless steel Right handed patients were fitted with right handed splithooks and left handed patients with left handed ones provided this was compatible with the neurologic deficit Although it is possible to use bilateral splithooks experiments showed use of one splithook to be most beneficial

One method of fitting is to anchor the end of the cable to a loop that can be moved by hooking either the thumb or the palm of the hand into the loop and pushing forward with abduction of the scapula and flexion of the trunk aided by gravity The cable housing is attached to a loop which is placed around the left handle of the wheel chair The split hook can be clamped onto this loop near the handle when not in use and then it is not only out of the way but in a readily available position when wanted A cuff may be used on the right arm in place of the right shoulder loop (Fig 160) The cable housing is fastened to the cuff This type of harnessing makes it easier for the patient to operate the device The chief disadvantage of the arm cuff is that the patient requires assistance in putting on the harness

A left handed splithook can be mounted on a device for the right hand (Fig 161) Although the tip of the movable lever is close to the little finger no change in functional value of the splithook has been noted There are narrow slots in the ends of the movable lever and bar to which the cable housing is attached so that cable and cable housing can be removed This makes it possible to change from one type of splithook to another without removing the harness.

Most benefited by the splithook were patients with complete lesions at the 5th and 6th cervical levels

► [Patients with complete spinal cord lesions in the cervical area have been considered beyond hope of rehabilitation. The studies reported in this paper are significant. They offer the first encouragement that I have known about for some degree of independent activity on the part of these patients. All who treat paraplegia should read the complete paper —Ed.]

SURGICAL AND DIAGNOSTIC TECHNICS

Bone Puncture for Diagnosis of Lesions in Osseous System, with Special Reference to Metastases, is described by E A van Slooten and J F Hampe[5] (Amsterdam)

APPARATUS.—A hollow needle (2 mm. caliber) of strong stainless steel about 20 cm long is sharpened like a trepan, with a short cutting edge. The wall of the needle is ground down to thickness of 0.25 mm. for 4 cm. above the point the wall of the upper portion is 0.5

(5) Nederl. tijdschr geneesk. 100 546-552, Feb. 25 1956.

mm. thick, so that bending is precluded, even with strong axial pressure. The needle is polished inside and out. At the upper end is a syringe attachment with thick walls, cylindric outside and slightly conical inside so that a drill can be connected if desirable. Two thick wings, 3 cm. long are attached at the upper end to facilitate insertion and withdrawal of the needle (Fig 162) A hard steel obturator which fits precisely in the bore has a triple beveled sharp cutting point that protrudes beyond the shaft and a flat knob (2 cm. diameter) at its upper end

TECHNIC.—A small stab incision is made in the skin, after which the needle with pointed obturator is inserted as far as the periosteum.

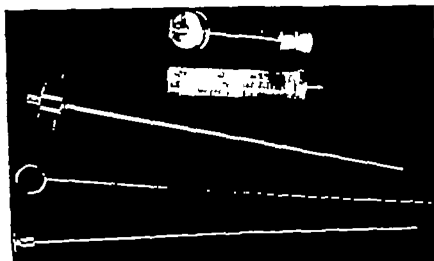


Fig. 162.—Apparatus for bone puncture (top to bottom) vacuum syringe, needle with wings and thin polished lower end, obturator with flat, sharpened point for withdrawal of tissue and pointed obturator for boring through cortical bone. (Courtesy of van Slooten, E. A., and Hampe J F Nederl. tijdschr geneesk. 100 546-552, Feb. 25 1956)

With to-and fro motion, the needle is drilled in until the cutting edge penetrates through the corticalis, recognized usually by decreased resistance. The obturator is then withdrawn and the needle drilled deeper into the bone by twisting slowly to and fro Boring must be done with force, but slowly and cautiously to avoid damage to bone marrow

The vacuum syringe is attached at the point of insertion and the needle cautiously withdrawn The stab wound is closed with a small pressure bandage. With a second blunt, polished obturator the tissue in the needle is pushed out and placed in fixative. When the bone marrow is compact (Paget's disease) or if the bore contains too much cortical bone, the specimen is difficult to push out and the tissue section may be damaged by compression. In such a case, a second puncture is advisable, with efforts to confine the specimen to marrow or to take a small piece in case of fibrous tissue. The bone marrow

specimen generally ranges from 1 to 3 cm Susa s mixture is recommended as a fixative and serves also to decalcify the tissue. Care must be taken that the needle point does not come in contact with this solution. The tissue preparation can be made a day or two later

Causes of biopsy failures are chiefly (1) exertion of too much pressure in boring (2) wrong direction, so that the needle encounters hard tissue (3) too fast rotation of the needle (when a drill is used) which produces heat damaging to the tissue

Bone marrow puncture may be used to supplement x ray findings Removal of tissue at the site of an obvious lesion may be termed direct biopsy By this means an exact pathologicoanatomic diagnosis was obtained in 11 of 12 cases of bone lesions In one case the specimen was not suitable for histologic study because it contained only loose cells and blood due to vascularity and softness of the tumor

In conditions in which a diffuse disease of bone marrow is suspected puncture may be made at an arbitrarily selected easily accessible site such as the anterior superior iliac spine iliac crest trochanter major calcaneus or spinous process of a vertebra This may be termed indirect biopsy" It was done in 74 cases In 10 suitable material was not obtained or repeated puncture was required Pathologic tissue was found in 31 In 25 x ray appearances aroused suspicion of metastases at the puncture site and pathologic tissue was obtained in 18 puncture was unsuccessful in 3 In 11 roentgen changes were visible elsewhere in the skeleton but not in the region of puncture in 3 of these definite histologic changes were found Among 29 cases in which no x ray changes were revealed pathologic material was obtained by puncture in 9

► [The technic reported by van Slooten and Hampe appears relatively safe and satisfactory for obtaining adequate diagnostic material. It is certainly preferable to large cork bore punches which may injure blood vessels, nerves and other structures.—Ed.]

Osteotaxis Reconsideration of External Skeletal Fixation is presented by Raoul Hoffmann[6] (Geneva) Osteotaxis aims at taking direct hold of the bone without laying it bare and at providing the patient with a temporary skeleton Before fracture reduction is started the bone ends are fitted with transcutaneous grips at some distance from the fo-

(6) Indian J Surg 17 3 311 December 1955

cus Two sets of bone screws are inserted into the bone through the soft parts to the required depth Grips are then attached to the bone screws They are short hand hold splints, provided with ball and socket joints which can be locked in any position Fluoroscopy is used only later for

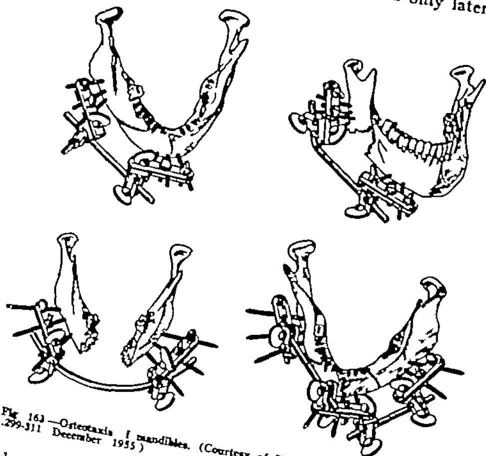


Fig 163 —Osteotaxis of mandibles. (Courtesy of Hoffmann, R. Indian J Surg. 17:299-311 December 1955)

reduction As soon as the ball and-socket joints are tightened on an external coupling bar the fracture is firmly fixed Thus the transcutaneous support is no longer a reducer but a fixer and the patient has his temporary skeleton " just as in a medullary nailing Secondary adjustments are possible simply by unlocking the ball and socket joints Moreover if continuous axial pressure is needed a special coupling bar may be used which can be shortened by nuts Toward the end of treatment before removing the trans

cutaneous support one or several trial unlockings will show how union is progressing

Indications for this procedure include open fracture, multiple fracture delayed union and pseudoarthrosis and multiple fractures of the mandible (Fig 163) With the transcutaneous support it is possible to create intentionally a



Fig 164 —Arthroplasty of elbow (Courtesy f Hoffmann R.: Indian J Surg 17: 299-311 December 1955)

gap between the bony sections in certain arthroplasties Figure 164 shows the elbow of a tuberculous patient in whom the bone ends were separated at the end of the operation and afterward for about a month the angle of the newly shaped elbow was changed every four to five days to prevent ankylosis The patient recovered a strong and mobile joint

Compared with medullary nailing osteotaxis gives the same or better results with lesser dangers and technical difficulties

► [The equipment devised by Hoffmann can be used with minimal trauma to the tissues In open infected fractures for which frequent dressings may be necessary internal fixation at the site of the fracture is definitely contraindicated, and the osteotaxis principle can be utilized to excellent advantage. The pins should be inserted at a distance from the fracture site to keep from spreading the infection. This equipment can be used for distraction after osteotomy for lengthening of long bones. This is ideal for treatment of multiple fractures of the mandible. Most orthopedic surgeons have long since abandoned use of any method which includes continuous penetration of the skin by a pin inserted into bone for fractures which can be dealt with adequately by other methods such as intramedullary rods or slotted plates —Ed.]

Sciatic Tension Test described by William Minor Deyerle and Virgil R. May Jr [7] (Richmond Va) was devised to demonstrate presence or absence of nerve root pressure as the causative agent in back and leg pain It allows the examiner to differentiate the pain of root compression from other causes of low back pain and sciatic even in the earliest stages

TECHNIC.—The patient is instructed to sit on a table, holding the back as straight as possible and sitting directly in line with no twist. He should brace himself with his hands and should not move his back or any portion of the body The affected limb is extended passively at the knee until the patient states that the leg pain or a portion of the pain is reproduced. The leg is lowered just below the point of pain and is held clasped between the examiner's knees with the second and third fingers of the examiner's hands pressed on the sciatic nerve in the popliteal space which has been "bowstringed" by this procedure. Pressure can be made directly over the tense "bowstring" sciatic nerve (Fig 165) This maneuver causes some local discomfort, but it is much overshadowed by severe reproduction of the sciatic pain. The entire pain or any portion of the pain of which the patient complains may be reproduced. Pressure may be applied over the popliteal space with the leg fixed in the position of maximal pain.

The test may be performed on the contralateral leg and pain reproduced on the affected side suggests that any herniated disk may be in the region of the crotch of the nerve rather than laterally where it is usually placed. In borderline cases the position may be altered to one of forward flexion of the head and trunk with dorsiflexion of the foot all these motions are done before starting the test The patient should again be instructed to maintain this attitude throughout the test This latter position increases tension of the nerve root and dura thereby increasing sensitivity of the test

(7) South. M. J 49:999-1005 September 1956.

The test is often positive long before any other signs of nerve root pressure can be demonstrated Owing to the selectivity of the test, there are few false positive reactions. It is felt that positive reactions eventually subsiding on conservative treatment were due to true nerve root pressure. The pressure had been due in part to edema in and around the nerve root

Malingerers may be recognized by this test. After going

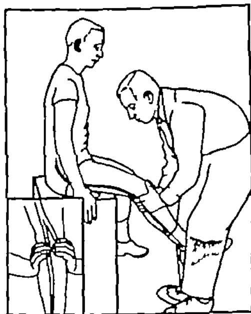


Fig. 165—With leg locked between examiner's knees at subpain level, pressure is applied over sciatic nerve in popliteal space. In positive case, pain is reproduced in back or leg, or both. (Courtesy of Deyerle, W M. and May V R., Jr: South M. J 49:999-1005 September 1956)

through the formality of the test up to the point where the patient is asked to tell when his pain is reproduced the examiner has at this point his fingers over the sciatic nerve and his thumbs over the region of the patella After expectantly asking the patient whether or not the next maneuver will reproduce the pain of which he complains the examiner reverses the procedure and does not press on the sciatic nerve but instead firmly over the patella. In some instances the patient will state that this reproduces his entire pain if he does so it is obvious that there is no anatomic mechanism whereby pressure over the patella, or on

an otherwise immobilized leg could cause any reproduction of back or leg pain

On the basis of 182 consecutive patients it was found that a patient with a positive test has a 75% chance of requiring operation or a patient with a negative test has a 95% chance of not needing an operation

Transposition of Tibialis Anterior in Treatment of Paralytic Talipes Calcaneus is discussed by Charles H Hern-



Fig. 166 (left) —Short linear incision is made over medial aspect of base of first metatarsal tibialis anterior is isolated and divided at insertion.

Fig. 167 (right) —Tibialis anterior is withdrawn through incision about 3 in. proximal to ankle joint. Wide opening is made in interosseous membrane, and tendon is passed posteriorly between tibia and fibula. Tendo achillis is split at insertion to calcaneus, and tibialis anterior is drawn through opening.

(Courtesy of Herndon, C. H., *et al.* J Bone & Joint Surg. 38-A 751-760 July 1956.)

don Joseph M Strong and Clarence H Heyman[8] (Cleveland) This condition is one of the most disabling deformities that may develop in the paralytic foot. If allowed to progress until there is equinus deformity of the forepart of the foot, contracture of the plantar fascia and clawing of the toes the deformity also becomes one of the most difficult for the orthopedic surgeon to correct satisfactorily The authors advocate early transference of the tibialis anterior into the heel in selected patients as an efficient method of preventing serious paralytic talipes calcaneus

TECHNIC —Skin incisions are made as indicated in Figures 166 and 167 The tibialis anterior is divided at its insertion and withdrawn anteriorly through a short incision about 3 in. proximal to the

(8) J Bone & Joint Surg. 38-A 751 760, July 1956.

ankle joint. A wide opening is made in the interosseous membrane, and the tendon is passed between tibia and fibula posteriorly The interosseous membrane at the junction of the middle and lower thirds of the leg presents little resistance to the passing of the tendon between tibia and fibula. The authors have made the opening by pushing a blunt instrument through the membrane, then enlarging the opening by spreading a hemostat or Kelly clamp No attempt was made to form a special trap-door opening through the membrane. The tendo achillis is split at its attachment to the calcaneus and the tibialis anterior is buried in a shallow gutter of bone or under an osteoperiosteal flap made at the posterior aspect of the calcaneus at the insertion of the tendo achillis. Reinforcing sutures to the tendo achillis are placed for security

This method of attachment is preferred as it gives good bony fixation, and, as the apophysis grows the tendon is carried with it, posteriorly maintaining satisfactory leverage action A tendon-to-bone attachment rather than an easier tendon to-tendon suture is important for the best results. No abnormalities of growth of the apophysis followed this method of fixation. The tendon is sutured so that it is just taut with the foot in maximal plantar flexion. Plaster immobilization is maintained for six weeks and brace protection afterward for three to four months.

The authors used this technic in 14 patients who had residual paralysis of the triceps surae after poliomyelitis. In two patients the operation was performed too recently for evaluation Of the other 12 7 had excellent 3 good and 2 fair results Footdrop did not occur after operation and in no instance did a contracture develop which has prevented the patient from getting the heel to the floor normally

"Percutaneous" Bone Surgery is discussed by G Kuntscher[9] (Schleswig Hesterberg) Although in all bone surgery penetration of skin and soft tissues is necessary to reach the bone almost all of the complications result from injury to the soft tissues Closed intramedullary nailing permits access to the bones with the smallest skin wound and practically no cutting of muscles The length of the operation for marrow nailing is reduced to about five to eight minutes for the lower leg which means a shorter period of anesthesia and reduced blood loss The skin incision can be closed with two to three metal clips A further advantage of medullary nailing is the early institution of unrestricted active movement which hastens callus formation With reg

(9) Chirurg 26 481-488 November 1955



Fig. 168.—Diagonal break of lower third of tibia treated with marrow nailing *A* before treatment. *B* immediately after *C* after removal of nail (seven months later) (Courtesy of Kuntscher G. Chirurg 26 481-488, November 1955)

ular marrow nailing the play of mechanical forces at the fracture line is eliminated but, leaving the fracture hematoma undisturbed and the periosteum untouched plays an important role in callus formation and nutrition Hence closed marrow nailing should be used as often as possible and should not be limited to transverse fractures of the femur Herzog's stiff nail constitutes an essential simplification and improvement for marrow nailing of the lower leg and upper arm An oblique fracture often indicates the u

of this method In a distally situated fracture such as the diagonal break of the lower third of the tibia shown in Figure 168, the nail point must penetrate deep in the spongiosa to guarantee a stable osteosynthesis In this case standing and weight bearing followed eight days after nailing and the fracture healed in excellent position (Fig 168, C)

The nailing of fractures near the joint is also possible by using a much thinner nail In fractures of the knee joint, the supracondylar femur and the tibial head a 65 cm needle can be inserted from the trochanter point (i e. with a puncture incision) to achieve stable osteosynthesis which allows standing up even on the day of operation Bone stiffening is thereby avoided and in some cases mobility of joint is restored after withdrawal of the nail

With careful slow introduction of the nail in 56 patients almost all elderly Küntscher observed no signs of shock and there were no deaths Easy penetration of a nail through a joint does not produce an arthrodesis except for a functional arthrodesis while the nail is in place. Seldom does anatomic arthrodesis i e., bony union result This requires an additional procedure to stimulate irritation and consequent callus formation Chemical means such as the introduction of tincture of iodine, have not influenced the course. Splinting according to Kirschner s method and (preferably) percutaneous pulverization of the joint have been wholly successful By the latter a bone graft is produced at the fracture site which does not come in contact with the surgeon s hands or the air and the fracture hematoma remains in place Thus closed arthrodesis of the hip joint can be carried out through the same small incision on the outer side of the greater trochanter which is used for nailing the femoral neck The cartilage surface of the head and socket are destroyed percutaneously and the head and socket are pulverized producing about 40 cc. of bone meal A hole is bored on the outer side of the femur and a 12 mm bore is introduced extending into the head for 50 mm The bore is rotated and pushed back and forth producing a cylinder filled with bone meal to a height of 40-50 mm and about 50 mm in diameter To take that much bone from any other place in the body would require a large skin incision and soft

tissue wound Fixation of the destroyed joint follows using two curved nails because a global joint cannot be stabilized with one nail alone. No plaster cast is applied and standing and weight bearing are permitted after 14 days

This method was also used in 26 hip arthrodeses and produced striking callus formation None of the patients (most of whom were poor risks) showed the slightest sign of shock and there were no complications

Percutaneous pulverization of bone is suitable also for the percutaneous management of pseudarthroses in which accurate reposition is possible Special marrow borers have been developed for this purpose Kuntscher s percutaneous technic can also be used for osteotomy and bone grafting

Plasma Clot Suture of Tendons Experimental Study Leroy S Lavine[1] (State Univ of New York New York City) compared the effectiveness of plasma clot suture technic with that of arterial silk and of tantalum wire in the suturing of the plantar flexor tendons of 15 rabbits (three series of 5 each) After suturing was complete the legs were immobilized in long plaster-of paris leg casts and penicillin was given intramuscularly There were no infections The animals were killed at intervals of two three and four weeks The suture line and an adjacent inch of tendon were removed fixed sectioned and stained with hematoxylin and eosin and then examined histologically

The tendon sutured by the plasma clot technic showed the least gross reaction In all areas it could be separated from the surrounding tissue with comparative ease Histologic examination of the specimens verified the gross evaluation All tendons showed union and practically no reaction

One criticism of the method is that the suture line pulls apart during the first few days This does not occur however if adequate immobilization of the limb is maintained. In using the plasma clot technic a pull-out suture at a distance will relieve longitudinal tension The plasma clot then prevents side to-side forces from disrupting the suture line. Moreover because the clot may act as a tendon sheath (as is the case in nerve suture where the clot acts as a nerve sheath) scar tissue encroachment on the suture line probably may be prevented

(1) Bull New York Acad. Med. 32:651-656 Septem[illegible]

Phlebography of Intervertebral Plexus In lesions restricted to the intervertebral disk myelography occasionally combined with discography is the routine diagnostic approach In rarer cases of altered morphology (hemangiomas extradural tumors etc.) and especially in cases affecting the function of the circulation—extravasal effects of fractures and hematomas as well as intravasal disturbances) serial phlebography may be helpful.

Olof Perey John Lind and Carl Wegelius[2] (Stockholm) studied the intervertebral plexus in patients with long standing incapacitating backache who had had every conservative treatment as well as negative myelograms by using the following technic. A catheter with a balloon was inserted through the vena saphena when the balloon was filled with contrast medium it blocked the lower part of the vena cava. After this 20-40 cc of a 70% contrast medium was injected while two synchronous film changers with exposures in frontal and lateral views took films at a rate of 1 5 picture/second Five of 10 patients sensed their usual back pain at the injection of contrast material. The patients stood the procedure well

This procedure permits study of the speed of the flow of the contrast medium and estimation of the dynamics of circulation may contribute to the explanation of certain at present unexplainable back troubles

Rational Approach to Surgical Needs of Cerebral Palsy Patient is discussed by Lenox D Baker[3] (Duke Univ) Surgical correction should be carried out as early as feasible and should be directed at preventing bad locomotion habits As a result of the normal development which takes place in the undiseased portions of the central nervous system the paralysis from these irreparable central nervous system lesions usually improves spontaneously

In the patient with complex weight bearing joint deformities it is difficult to determine which deformity is primary and which one or more compensatory Each of the deformities may be an entity within itself or instead of being compensatory or primary may be the result of overflow

The major foot deformity seen in such a patient has re

(2) Acta orthop scandinav 25 228-233 1956.
(3) J Bone & Joint Surg 38-A 313-323 April, 1956

Fig 169.—Technic for lengthening aponeurosis of gastrocnemius muscle. A incision extends from lower border of belly of gastrocnemius to proximal end of Achilles tendon B inserted l incision made through aponeurosis, lateral and medial portions remaining intact with underlying soleus muscle Middle portion, or tongue is dissected from soleus, care being taken that no muscle fibers remain attached to this portion of aponeurosis or to Achilles tendon C dissection of central aponeurosis of bipenniform soleus muscle D dissection is carried out sufficiently to allow full dorsiflexion of ankle E distal attachment of lateral and medial portions of aponeurosis are freed from tendon; four corners of overlapping portions of aponeurosis are held with one black silk suture each F after closure of deep and subcutaneous fascia, skin is closed with intracutaneous sutures G extremity encased in toe-to-groin cast with foot placed in slight dorsiflexion. (Courtesy of Baker L. D J Bone & Joint S 38 A 313-323 April, 1936.)

sulted in most instances from spasticity tension, or shortening of the triceps surae The valgus deformity of the foot may be the result of an overlooked spasticity or tension in the peroneus longus or brevis muscles Usually associated with these changes are a nonfunctioning tibialis anterior and a stretched-out tibialis posterior If no structural changes have occurred this type of valgus deformity can sometimes be corrected by transplantation of one of the peroneus tendons to the tibialis posterior When the peroneus longus is used the distal stump should be sutured into the tendon of the peroneus brevis Such a transplantation combined with a triceps surae lengthening can produce a balanced foot and possibly prevent subtalar stabilization. The operation is reversible

If lengthening is indicated in the calf muscles surgery in most instances is confined to a lengthening of the aponeurosis of the gastrocnemius with the soleus fibers dissected from the distal portion of the aponeurosis (Fig 169) When this type of lengthening is carried out for correction of postpoliomyelitic contractures the soleus fibers are not dissected from the distal tongue except as may be necessary to accomplish the desired lengthening If the soleus is not dissected in spastic cerebral palsy stretch reflex will result in clonus

In evaluating knee flexion deformity the part played by the gastrocnemius and by the hamstrings must be determined by standard tests before surgery is directed at correcting the deforming force When the gastrocnemius is involved lengthening of the aponeurosis or release of the origin of the muscle from the condyles of the femur and from the posterior aspect of the capsule of the knee joint may be considered If it is necessary to correct flexion one of these procedures can be combined with lengthening or tenotomy of the hamstrings

Without full knee extension on weight bearing compensatory hip flexion deformity cannot be avoided The tensor fasciae latae is at fault in most patients who present flexion internal rotation deformity As a result of an area 4 involvement many may present flaccid paralysis particularly of the gluteals abdominals and abductors of the hips Such

weakness is not necessarily central in origin but i due to overstretching and long disuse If the patie bring the weak muscles into play release of the spa or tension in the antagonist will contribute materia the possibility of redeveloping balanced power This velopment program is more likely to be successful in younger group in which correction has been carried out fore fixed fascial contractures and joint deformities h occurred.

When only tendon and muscle surgery has been done t extremities are kept in casts for four to six weeks or longe If bone block procedures have been done, the foot is im mobilized for 10 weeks Later if necessary braces with any indicated ankle knee or hip locks or pelvic bands may be used.

► [That most orthopedic surgeons dislike to try to treat the cerebral palsy patient is probably an understatement. The reason for this shrinking from the patient with cerebral palsy is that few surgeons have learned the indi cations for and the technics of the many helpful surgical procedures that can be utilized to the benefit of the patients. This article is timely and will be helpful to orthopedic surgeons who wish to render better care to their cerebral palsy patients.—Ed.]

Safe Traction in Children with Fractured Femurs is de scribed by Homer H Stryker[4] (Kalamazoo Mich) In chil dren aged up to 2 years the legs are suspended in vertical traction (Bryant s traction) For those aged 2-4 a support ing band is added at the back of the knees to keep them in slight flexion Patients aged 4-10 are placed in straight trac tion on the inclined converted frame the affected leg is fas tened to the end of the frame and the pull of the body on the inclined plane furnishes the traction The angle of inclina ion determines the amount of pull Roughly each degree of levation will produce traction equal to 1% of the child s weight An inclination of 20-25 degrees is sufficient to re duce and maintain length and alinement in the femur Up to ½ in over riding is preferable to complete restoration of length since the stimulation of growth resulting from the fracture compensates for the initial loss of length If great effort is exerted to restore the leg to its normal length initially the affected leg may become longer than the unin jured member After 24 hours the traction should be checked

(4) J.A.M.A. 160:188 Feb 4 1956.

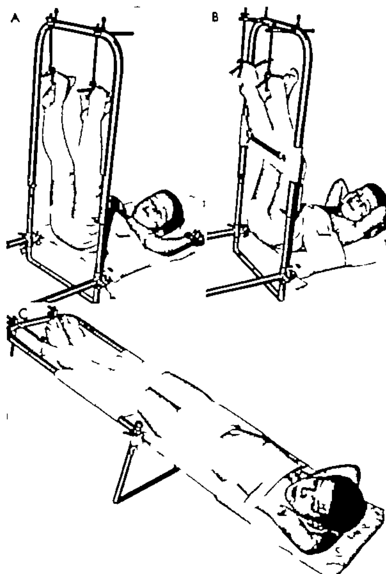


Fig 170 — *A* frame arranged for Bryant suspension traction ref for children up to 2 years *B* frame arranged for modified Bryant' traction, recommended for children aged 2-4 padded band at back of knees keeps them slightly flexed. *C* frame arranged for traction in extension, for children aged 4-10 Length is adjusted to size f child. Center section under buttocks i dropped for bedpan service. (Courtesy of Stryker H. H J.A.M.A. 160 388 Feb. 4 1956)

by x rays and the angle of inclination of the frame adjusted to increase or decrease the amount of traction as required (Fig 170)

Skeletal traction may be substituted for skin traction in the older group The frame allows control of traction and patient is easily converted from one style of traction to another and allows transportation of patient for x ray examination or return home It may also be used in any other type of case requiring leg traction and is ideal for reduction of congenital dislocation of the hip

► [This is a practical suggestion. With its use as described, all serious complications which have been reported from Bryant's traction would be avoided.—Ed.]

Present Problems in Contrast Medium Studies of Spinal Canal. K. Reinhardt[5] (Homburg an der Saar Germany) notes that opinions differ as to the value and necessity of contrast medium roentgenography of the spinal canal For confirmation and localization of spinal tumors myelography with iodol (either jodipin or thin flowing pantopaque®) is considered Use of air and oxygen as contrast mediums are less dangerous but yield less dependable diagnostic findings Iodol often produces disagreeable complications Meningeal irritation with fever is frequent, but late sequelae, e.g oil granulomas in the lumbar sac are more serious Figure 171 shows a granulomatous caking of iodol in the cauda equina, causing increasingly severe uncontrollable radicular pain Jodipin tends to produce hard caking more than pantopaque® Surgical removal of such an oil granuloma is practically impossible If contrast medium reaches into basal cisterns of the skull it may produce signs of a pontocerebellar tumor Pantopaque® remains mobile for a long time and can be found in skull roentgenograms weeks and months after myelography

Despite these complications iodol myelography in diagnosis of spinal tumors cannot be overlooked When localization cannot be accurately determined by clinical examination results of myelography may not be wholly reliable because of arachnoid growth in the tumor region. Jodipin must be removed at operation if possible. When pant-

(5) Fortschr Geb. Röntgenstrahlen 83:409-419 December 1955.

opaque* is used, it may gather in the caudal dural sac, in which case its withdrawal after examination is seldom complete It is important to remove it at least in part since clinical appearance of oil granuloma is approximately parallel to the amount of iodol remaining in subarachnoid space.



Fig. 171 (Courtesy of Reinhardt K. Fortschr Geb. Röntgenstrahlen 83:809 819 December 1955)

Diagnostic results are impaired by the tendency of iodol to separate into drops which become trapped in arachnoid wings and root pockets and may simulate small tumors. Hence the constant search for better contrast mediums

In the lumbar region myelography is used principally for etiologic clarification of radicular pain and to demonstrate nucleus pulposus prolapse In these relatively benign conditions it is not advisable to risk possible injury by jodipin which should be restricted to investigation of upper lumbar

disks and other special indications Because of its poor contrast air myelography is effective only in thin patients and is in any case inferior to positive contrast mediums Since the gas must be injected under pressure it sometimes causes radicular pain and leg spasms despite published statements that this method is free from sequelae

The method of choice in diagnosis of disk prolapse is myelography with water soluble abrodil Peridurography with perabrodil should be avoided because it has produced at least four known deaths Perabrodil is relatively safe in the peridural space but can cause death if it reaches the subarachnoid space Severe complications reported in lumbar myelography have been due partly to the erroneous use of perabrodil instead of abrodil

In cases studied by the author localization of disk lesions on the basis of neurologic examination showed L 2/3 0% L 3/4 0% 2d 3d lumbar level 0% 3d to 4th lumbar 0% L 4/5 40% L 5/S₁ 60% 4th 5th lumbar 40% 5th lumbar to 1st sacral 60% multiple prolapses 0% In contrast localization by myelogram showed 2d 3d lumbar level 3% 3d-4th lumbar 17% L 2/3 3% L 3/4 17% 4th 5th lumbar 33% 5th lumbar to 1st sacral L 5/S₁ 25% multiple prolapses 15% no prolapse demonstrable 7% Thus neurologic examination did not suffice for recognition of disk anomalies in upper vertebrae multiple prolapses or level of localization Myelographic diagnosis in operated patients was always correct Although myelography is not 100% accurate it is a valuable supplement to thorough clinical examination

Complications which may result from abrodil myelography include injuries of nerve roots and disks hematomas under the vertebral periosteum and meningitis Most serious are meniscus infections and all complications seen with lumbar anesthesia are theoretically possible A contrast medium could cause shock or iodism in hypersensitive patients but no such complication was reported. Using premedication with a barbiturate e g effortil (Bohringer) and phenergan* neither immediate nor late complications of abrodil myelography were observed Effortil prevents severe blood pressure drop and circulatory collapse

antihistamine phenergan* is used as a precaution against allergic reaction to iodine During examination patients are kept immobile and remain at rest two to three hours thereafter with elevation of the upper part of the body

Combined Hip Fusion and Subtrochanteric Osteotomy Allowing Early Ambulation is discussed by Frederick R. Thompson[6] (St Luke's Hosp New York) The disadvantages of hip fusion have been the magnitude of the surgery involved high incidence of pseudoarthrosis resulting stiff knee and expensive months of bed rest The purpose of the subtrochanteric osteotomy in Thompson's procedure is to

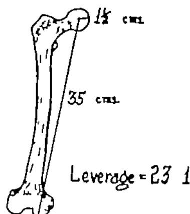


Fig 172—In hip fusion subtrochanteric osteotomy eliminates leverage action of femur which is normally about 23 1 but may be as much as 55 1 (Courtesy of Thompson, F R. J Bone & Joint Surg. 38-A 13-22 January 1956.)

keep the long lever arm of the femur from causing motion at the site of the intended fusion After hip fusion the femur, with the center of the head acting as a fulcrum has a lever action of 23 1 the shaft being about 35 cm and the radius of the head being about 1 5 cm (Fig 172) This 23 1 lever action makes minor thigh movements in the plaster of considerable significance. If the knee is fully extended the lever action may be as much as 55 1 The osteotomy prevents this forceful lever from acting on the fusion site during the first postoperative weeks

In the present fusion operation iliac chips are placed superolaterally so as to show in silhouette on the x ray An

(6) J Bone & Joint Surg. 38-A 13-22, January 1956.

iliac graft is screwed to the ilium and femoral head and an osteotomy is performed to eliminate the lever action of the femoral shaft (Fig. 173).

A single hip spica is applied after the operation; the ankle is left free. If shortening of the leg does not have to be compensated for by fusion of the hip in a position of abduction, the best position for the hip is believed to be 5 degrees of adduction, neutral rotation and 20 degrees of flexion. Ambulation may be begun within a week. The spica is generally

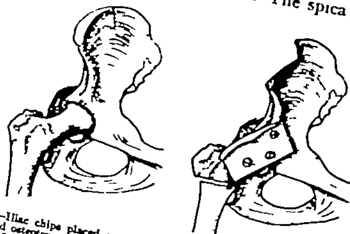


Fig. 173.—Iliac chips placed superolaterally; iliac graft screwed to ilium and femoral head and osteotomy performed. (Courtesy of Thompson, F. R.: J. Bone & Joint Surg. 38-A: 13-22, January, 1956.)

removed at the third month so that adequate x-ray examinations and a test of solidity may be made.

Subtrochanteric osteotomy performed at the time of primary hip arthrodesis was helpful in lowering the rate of pseudoarthrosis. The use of a single hip spica in conjunction with osteotomy at the time of arthrodesis was not harmful. The single hip spica allowed earlier ambulation and was successful in maintaining the desired position of the limb.

▶ [The technic described here is practical and, if followed, the results of operations for fusion of the hip joint should be more uniformly successful than by any other method which does not include subtrochanteric osteotomy.—Ed.]

Femoral Shortening by Step-Cut Osteotomy and Intramedullary Nail was performed by Robert M. O'Brien and Richard E. Lord[7] (St. Louis Univ.) on 10 patients. About

(7) South. M. J. 48: 1288-1294, December, 1955.

half had low back pain resulting from pelvic tilt and were relieved by altering the leg length difference with shoe corrections Major shoe alterations are unsightly and expensive thus some patients sought an operative solution to

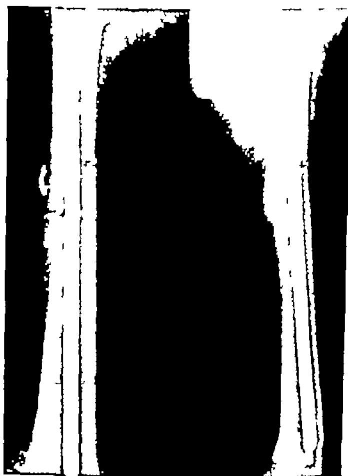


Fig. 174 —One day after step osteotomy and intramedullary nail fixation. (Courtesy of O Brien, R. M and Lord, R. E. South M J 48:1284-1294 December 1955)

their problem Femoral shortening operations should be considered when leg length difference exceeds 1 in The shortening ranges from 1⅜ to 3 in As the amount of bone removed approaches 3 in technical difficulties increase and external fixation may be needed in some instances

No delayed unions nonunion or infections have occurred The commonest operative complication was fracture of the

base of the osteotomy steps This can be avoided by using the oversized saw blade and remedied if it occurs by converting the step osteotomy into an oblique osteotomy

Postoperative plaster immobilization was necessary in two patients who required a walking spica Both had the maximum amount of shortening

Step osteotomy and intramedullary nail fixation offer the following advantages good stability protection against rotation at the fracture site assurance that the proper amount of bone has been removed desirable amount of bony contact (Fig 174) and minimal interference with normal function of the affected extremity diminishing tendencies to muscle atrophy and joint stiffness

Rayon Contact Dressings for Orthopedic Wounds. J E. M Thomson[8] (Orthopedic and Rehabilitation Center Lincoln Neb) found that a fine thin rayon fabric is the best solution to the problem of removing dressings without pain or discomfort and with the least injury to the open wound surfaces granulations or healing stitched closures Rayon conforms to the following physiologic principles essential for an ideal contact dressing (1) It is easily sterilized (2) It has a close enough weave to prevent capillary invasion into the meshes of the fabric. (3) It is loose enough to permit adequate drainage. (4) Its friction coefficient is sufficiently low to reflect minimal irritation to the wound surface (5) It can be removed from the wound when moistened with saline solution without sticking this reduces bleeding pain and discomfort.

Technic.—The fabric is autoclaved as needed. The clean sutured, operative wound is covered with a single thickness strip 1 2 in. wide, which is tailored to length, size and shape of the wound. It is moistened in normal saline solution when applied and reinforced with the usual overlaying gauze dressings Mechanic s waste is usually used as a compression dressing over all wounds of the lower extremity particularly those in which the joint has been opened and there is a possibility of bulging of the joint membranes with blood. Over the waste is placed firm sheet wadding or Webril bandage, crepe paper bias muslin or an elastic bandage. As the joint and wound are kept less boggy with blood, healing will take place more rapidly and dressings will be less soiled.

After the fourth or fifth day dressings can be reapplied without pressure, because by this time the danger of bleeding has passed.

(8) Am. J Surg. 91 413-414 March, 1956.

Freshly debrided wounds which cannot be closed or in which it is undesirable to apply a primary skin graft may be covered with the contact rayon tailored smoothly to cover the entire wound This tailored patch is then moistened with normal saline solution at the time of application

Open infected wounds covered with contact rayon must be kept moist with saline otherwise the dressings become saturated with exudate and tend to dry in the upper layers of the gauze and prevent adequate through and through drainage thus producing puddling absorption and irritation of the skin around the wound

With all wounds—whether open closed clean or infected—one should use only a single thickness of contact rayon cover since a double thickness is less permeable and tends to prevent secretions from draining

Vertebral Body Biopsy is described by Frederick S Craig[9] (New York Orthopaedic Hosp)

TECHNIC.—The skin of the back is prepared with soap the night before the procedure, and 30 minutes before the biopsy the patient is given sodium phenobarbital and an opiate. He is placed prone on the x ray table with pillows under the head and the tibiae for comfort, and the back is prepared. With the aid of an anteroposterior x ray the area of biopsy is selected. In the lumbar area the body is approached at right angles to its posterior third to prevent skidding. Once the path is planned, the 22 gauge needle is inserted at about 35 degrees to the perpendicular and advanced toward the spine the fascial planes being infiltrated with 2% procaine as they are encountered The transverse process is by passed above or below and the needle further advanced.

Usually radicular pain is next noted by the patient, at which point the syringe is removed from the needle and the lumen of the needle observed for one minute for escape of cerebrospinal fluid. If no spinal fluid is seen the needle is advanced another 0.5 cm. to the bone the periosteum is lightly infiltrated and anteroposterior and lateral x rays are made. From these films the relation of the needle to the desired point is determined and the further route of the needle planned. A stab wound through the skin and lumbodorsal fascia is then made and a trocar passed. If the position of the trocar checked by x ray is satisfactory it is held with its point firmly fixed against bone (Fig 175)

The cannula is passed over the trocar with a twisting motion until the end rests against bone or annulus fibrosus. One of the cutters is placed in the cannula and used like a cork borer to cut the bone. From time to time the lumen of the cutter is palpated with the blunt stylet to determine the length of the core being obtained. The stylet

(9) J Bone & Joint Surg. 38-A-93-102, January 1956.

is left in the cutter as the latter is withdrawn as an indication that the core is also retained. It is often necessary to use the worm to insure that the core actually is removed with the cutter After withdrawal of the cutter the blunt stylet is used to express the core into a fixative solution. If the biopsy is done in the region of the thoracic spine, the inferior surface of a rib is followed to a point slightly below the articulation of this rib with the body to be biopsied.

In the presence of an abscess, it is sometimes impossible



Fig. 175—Trocar correctly placed for biopsy of 2d lumbar vertebra. Diagnosis in this case was adenocarcinoma of unknown primary site. (Courtesy of Craig F S J Bone & Joint Surg 38-A 93-102, January 1956.)

to obtain adequate local anesthesia to allow penetration of the cavity wall because of the tension causing severe radicular pain The area to be biopsied must be carefully selected otherwise the section taken may show only the reaction of bone to the disease without revealing the cause of the disease.

► [Most orthopedic surgeons in the United States have been hesitant about attempting punch biopsies of vertebral bodies in the thoracic area. The dangers of such an approach have been apparent. The technic described by Craig and carefully illustrated in this excellent article reduces these hazards to a minimum. If this technic is followed, the hazards not be as great as those attending an open operation for biopsy —

INSTRUMENTS APPLIANCES AND BONE BANKS

Cathode Ray Sterilization of Bone Grafts was investigated by Jonathan Cohen[1] (Harvard Med School) who compared the histology of the tissue reactions with inlay grafts of homogenous refrigerated unirradiated bone and homogenous refrigerated irradiated bone. The experimental animals were adult cats

The bacteriologic cultures of all irradiated specimens showed no growth Organisms were recovered from all but one of the nonirradiated specimens Histologically no difference was detected in the reaction at the recipient site to the two types of grafts during any of the stages of healing studied. The grafts appeared as devitalized bone. As the period of repair lengthened the remnants of the graft decreased in size but there was no difference in the rate of disappearance of irradiated and nonirradiated grafts The only reaction at the recipient site seen initially was hemorrhage with minimal inflammatory reaction to it There was much variation in the specimens from any single healing stage Frequently the irradiated graft would show more absorption than its irradiated control or the surrounding recipient bed would show more advanced repair but just as often the reverse was true

Cathode ray irradiation is a reliable means of sterilizing contaminated specimens without significant deterioration

Sterilization of Preserved Bone Grafts by High Voltage Cathode Irradiation The mechanism by which ionizing radiations (x rays protons neutrons and electrons) result in the destruction of bacteria is not completely understood It is known that when ionizing radiations are passed through organic molecules a primary or direct action of ionization occurs which results in molecular degradation denaturization or depolymerization The manner of bacterial destruction is probably the direct action of ionization on the chromosomal nucleoprotein which results in lethal mutation

(1) A.M.A. Arch. S rg 71 784-789 November 1955

or prevention of reproduction Another important effect is the indirect action produced by the ionization of water molecules in or around the organic material This leads to production of free radicals (hydrogen atoms and hydroxyl radicals) The resulting oxidation and reduction reactions are destructive to tissue matrix as well as to bacteria but these tissue changes may be minimized by performing the irradiation at low temperatures T C Turner C A L. Bassett J W Pate P N Sawyer J G Trump and Kenneth Wright[2] found that 1 000 000 rep of high voltage cathode irradiation will adequately sterilize ⅛ in thick sections of freeze-dried and frozen animal bone after bacteriologic contamination with Staphylococcus aureus This sterilizing dose did not significantly impair graft healing in the dog

Cathode irradiation of dog bone grafts at 2 000 000-6 000 000 rep results in some healing impairment in freeze-dried grafts whereas it appears to accelerate the healing of frozen grafts This advantage for frozen irradiated bone is outweighed by the superior rate of incorporation of freeze-dried as compared with that of frozen grafts Irradiation causes gross and microscopic changes in bone grafts These consist primarily of a yellow discoloration before implantation increased basophilic staining after implantation and some impairment of the "cement line between the graft and the invading host bone These changes are roughly proportional to the irradiation dose.

Principles and Experiences at Implantation of Os Purum, Os Novum and Bone Granulate Svante Orell[3] (St. Göranssjukhus Stockholm) found that by the implantation in vivo in man of various kinds of bone grafts i e fresh bone boiled bone, os purum os novum and bone that has been repeatedly and alternately frozen and thawed the normal formation of new bone occurs in the interstices between the bone fragments and the regeneration and absorption of the bone is probably a surface effect Finely divided bone seems to be the best grafting material for surgical use because of its small interstices which at implantation are filled with blood and plasma—and proliferating connective tissue cells that

(2) J Bone & Joint Surg. 38-A 862 884 J ly 1956.
(3) Acta orthop. belg 4 162-174 1952.

grow into the fibrin network and are excited to abundant new bone formation by the peripheral stimulation zones of the bone fragments Homoplastic bone stored according to the deep freeze method in bone banks is easily obtained and available

To enable the new bone formation to proceed undisturbed, the skeletal parts and the bone granulate must be fixed either by absorbable large bone fragments steel or Vitallium or by external fixation appliances or all combined. Preferably the skeletal parts and the bone granulate should be pressed together so that the interstices become small and are quickly bridged over by the newly constructed bone tissue A periosteal callus as a bridge surrounding the bone ends is promoted by subperiosteal implantation of granulate. Defects and cysts in the skeleton can be repaired by filling with granulate Fixation materials of steel or Vitallium should if necessary be extracted when the new bone tissue has become sufficiently firm

Surgical Bone Grafting with Cultured Calf Bone is reported by William B Fischer and Irvin Clayton[4] (Northwestern Univ) Calf bone has been introduced as a new surgical bone grafting material The bone is taken from 300 lb calves under sterile conditions and stored for a minimum of 5½ months at 40 F before it is used Less osteocytic cell destruction is evident in calf bone than in frozen bone More significantly the bony architecture is altered to the extent that multiple cracks and spaces develop Also the calf bone surfaces become covered with a fine film of collagenous fibriles These changes conceivably promote incorporation with minimal osteoclastic reaction

Eight implants were performed with no ill effects Surgically no alteration from standard bone-grafting technics was made except that the patients were tested for bovine plasma sensitivity

► [Heterogenous bone grafts can be used successfully only if a means is found to change the antigenic factors. Cultured calf bone has been used successfully in the treatment of nonunion of fractures and in fusion of the spine. Extensive study of the fate of the bone transplant and of the problem of local unfavorable reactions to this foreign material must be carried out before this procedure can be recommended as a substitute for autogenous or homogenous bone grafts.—Ed.]

(4) Quart. Bull Northwestern Univ M. School 29 346-349 Winter 1955.

Cultured Calf Bone New Bone Grafting Material was tried by Irvin Clayton[5] (Northwestern Univ) in 61 patients 36 with lumbosacral fusions With one exception no infections or reactions were reported The results were as satis-



Fig. 176 (top) —Section of cortical calf bone denuded of its periosteum and stored in bovine plasma for six months, ×125

Fig. 177 (bottom) —Section of same bone after being stored at —10 F for six months ×125

(Courtesy of Clayton, I Illinois M. J 110 49 52 August, 1956.)

factory as those obtained with autogenous grafts Whether cultured calf bone is superior to autogenous bone cannot be stated until more clinical cases are studied.

A microscopic section of cortical calf bone denuded of its

periosteum and stored in bovine plasma at 40 F for six months shows fibrous proliferation from the surface of the bone (Fig 176) This section illustrates the large number of osteocytes present and a loose structure of the compact bone itself Microscopic section from a piece of cortical bone taken from the same calf as shown in Figure 176 but stored at —10 F for six months shows relatively few osteocytes



Fig 178 —Section through region of human bone grafted on calf bone. (Courtesy of Clayton, L Illinois M. J 110 49-52 August, 1956.)

no fibrous proliferation and a more compact bone structure (Fig 177)

The extensive collagenous proliferation demonstrated in bone stored in plasma at 40 F for several months is believed to be the ground substance or matrix of early bone formation in which apatite crystals are normally precipitated Loose bone structure and collagenous proliferation after storage in bovine plasma makes it unnecessary for the recipient to mobilize large numbers of osteoclasts before incorporation of the graft can begin which would explain the rapid union of this type of bone graft

To substantiate this another experiment was done. Since it is not desirable to take material for section from patients after the use of calf bone surgically it was decided to use human bone stored in human plasma at 40 F for 5½ to 15½ months as onlay grafts in the foreleg of a calf In the opposite leg of the same animal pieces of frozen human bone and calf autogenous bone were used as control grafts Six weeks postoperatively, the incisions were reopened There was early union of both sections of human bone which had been stored in plasma Microscopic section taken through the region of these grafts showed union and no foreign body reaction (Fig 178)

Experimental Comparison of Freeze-Dried and Frozen Cortical Bone Graft Healing was made by T C. Turner



Fig. 179 —Bilateral implantation of cortical inlay grafts in radii of dogs. (Courtesy of Turner T C., *et al* J Bone & Joint Surg 37 A 1197 1205 December 1955)

C A. L. Bassett J W Pate and P N Sawyer[6] (Nat'l Naval Med. Center Bethesda) Grafts were procured from adult mongrel dogs at sterile autopsy Freeze-drying was done for about two weeks The grafts were placed in individual vacuum sealed glass tubes and stored at room temperature. The frozen grafts were stored in individual tubes and kept at −78 C

Bilateral homogenous cortical inlay grafts measuring

(6) J Bone & Joint Surg. 37 A 1197 1205 December 1955

about 0 5×4 cm were implanted in the radii of 47 adult dogs controls of freeze-dried or frozen grafts were used on the left side and high voltage cathode irradiated freeze-dried or frozen grafts on the right side (Fig 179)

Freeze-dried grafts are definitely superior to similar frozen grafts in the rate of healing This was especially true in the earlier healing stages but it was also noted in the later stages Frozen grafts performed about 45% as well as freeze-dried grafts at 35 days and about 63% as well at 90 days

Injuries of Extensor Tendons in Distal Part of Leg and Ankle are comparatively rare Paul R. Lipscomb and Patrick J Kelly[7] (Mayo Clinic and Found) reviewed the records of 12 patients with 13 such injuries The same principles of treatment which apply to injuries of the wrist and hand apply to lacerations of tendons of the foot that occur in the lower part of the leg or at the level of the ankle. To prevent adherence of the tendon in scar tissue the sheath and surrounding ligamentous structures at the site of tendon repair should be excised cleanly Nonabsorbable sutures of wire or silk should be used for accurate approximation of the severed ends of the tendons after they have been squared off cleanly with a knife. All devitalized shreds of muscle should be trimmed away Additional incisions or any extension of the original laceration to secure retracted ends of tendons should be either transverse or curved so that the edges of the skin when sutured, do not overlie the repaired tendon in a longitudinal direction. In severe injuries of the extensor tendons of the foot it may be advisable to repair or reconstruct the tibialis anterior and the extensor hallucis longus tendons and in some instances the former only

Results of this treatment were good in nine fair in two and poor in two patients The factors limiting successful repair were (1) the anatomy of the injury site (2) the number of tendons severed (3) the presence of infection (4) concurrent injury to the ankle or subtalar joint and (5) the presence of an adherent scar and contracture of the Achilles tendon in old injuries

(7) J Bone & Joint Surg 37 A 1206-1213 December 1955

Immunologic Factors in Homogenous Bone Transplantation I Serologic Studies The successful use of relatively small amounts of homogenous preserved bone has been demonstrated experimentally and clinically Use of massive homogenous bone grafts with rare reported exceptions has not met with the same success In previous experiments on whole knee joint transplants in dogs marked consistent gross and microscopic differences were noted in the homogenous transplants as compared with the autogenous joints The former showed no rentention of living cells slow osteogenesis and ultimate severe degenerative changes similar to those seen in avascular necrosis

In an attempt to determine whether these differences in behavior could be explained on the basis of immunologic response in the animal to homogenous whole bone acting as an antigen Paul H Curtiss Jr and Charles H Herndon[8] (Cleveland) inserted intramuscularly into rabbits whole iliac bone washed iliac bone and cortical bone from an A positive dog This resulted in formation of high titer agglutinins against dog red blood cells Adsorption tests did not demonstrate any specificity of these agglutinins for the canine A factor in dog red blood cells

In two of five A negative dogs in each of which was transplanted a knee joint from an A positive dog low titer agglutinins against the red blood cells of the donor dog developed. Adsorption tests on the serums of these two dogs suggest the possible specificity of the agglutinins for the canine A substance although the possibility of the agglutinin being due to a factor other than the canine A factor was not excluded.

The authors suggest that transplanted dog bone or its contained cellular elements act as an antigen but no relation between that action and the blood type of the donor dog could be established with certainty

"Lively" Splint for Flail Hip The patient with a flail hip walks at a great disadvantage Instead of the normal pendulum motion at the hip the trunk on the affected side must drag and swing the leg forward Awkwardness is exaggerated by the sway and dip of the Trendelenburg' gait

(8) J Bone & Joint Surg 38-A 103-110 January 1956.

and if the leg is paralyzed as well the weak side is encumbered by the extra weight of a caliper Arthur J Helfet[9] (Cape Town) developed a splint on the principle that little force is required to initiate the swing of a pendulum and that if the leg is to be used as a pendulum, the length and weight of the splint are an advantage

The splint has three parts (Figs 180-182) Part 1 consists of the pelvic brace a light leather-covered metal frame

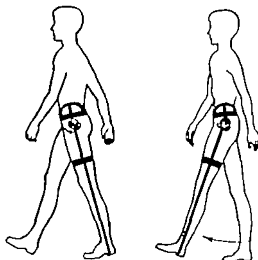


Fig. 180 (left) —Spring in splint is wound.
Fig 181 (right) —Spring is released, swinging leg forward in a fairly normal stride.
(Courtesy of Helfet, A. J South African M. J 3 495-496 May 26, 1956.)

adapted comfortably and firmly to the contours of the pelvis, thus giving stability to the spring and caliper below In the line of the trochanter of the femur the brace has a bar which meets an extension of the lateral bar of the caliper at a joint with a coil spring The center piece at the back reaches above the pelvis to act as a lever by which extension of the spine may control the hip spring Part 2 consists of a light caliper with a corset for the thigh and the lateral bar extending upward The caliper need not be weight relieving as in this apparatus the patient takes weight normally through the hip joint but if the hip is weak a thigh corset taking weight from the ischial tuberosity adds to stability

(9) South African M J 3 495 496, M y 26, 1956.

Part 3 is comprised of a joint and spring mechanism so fitted that when the thigh is extended the spring winds up When weight is shifted from one leg to another, the recoil strength of the spring is sufficient to initiate the forward swing of the limb

By taking a stride forward with the sound leg the spring is coiled A tilt on to the sound leg lifts the flail leg which

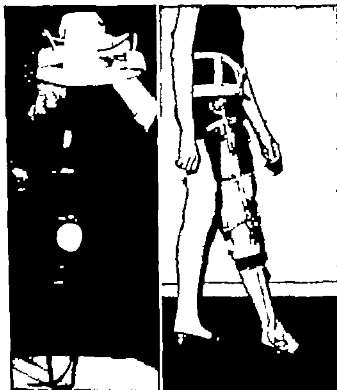


Fig 182 (left).—Spring from front. Leather cover is undone.
Fig. 183 (right) —Stride possible with flail right leg in splint.
(Courtesy of Helfet, A J South African M. J 3 495-496, May 26, 1956.)

as the spring unwinds immediately swings forward in a fairly normal stride The following step by the sound leg rewinds the spring and so on The spring mechanism is not bulky and is inconspicuous under the patient's clothes The winding of the spring is assisted by straightening the back and, with practice a strong back can give a strong stride.

Figure 183 shows the splint as used by a patient She is wearing a concealed footdrop appliance

CALCIUM AND PHOSPHORUS METABOLIC DISEASES OF BONES

Malabsorption and Bone Disease in Prolonged Obstructive Jaundice were studied by M Atkinson B E. C. Nordin and Sheila Sherlock[1] (Postgrad Med School London) in 25 patients The skeletal status was investigated in 24 Hepatocellular jaundice was present in 3 and intra or extra



Fig. 184 (left) —Thoracic spine x ray f patient with intrahepatic obstructive jaundice.
Fig. 185 (right) —X-ray of same patient 35 months later
(Courtesy of Atkinson, M et al. Quart. J Med. 25 299-312, July 1956.)

hepatic biliary obstruction in 22 The jaundice had lasted from three months to seven years Fat balances were estimated in 18 patients and steatorrhea was demonstrated in all There was an inverse relation between fat absorption and faecal stercobilinogen content and between the latter and the serum bilirubin level Nitrogen output was normal in 15 patients in whom it was investigated.

In eight patients the skeleton was considered to be nor

(1) Quart. J Med. 25 299 312, July 1956.

mal four had possible early osteomalacia since they excreted an abnormally low percentage of infused calcium

Osteomalacia, established by biochemical investigation, was found in seven patients in six of whom the histologic bone study confirmed the diagnosis The cortex and trabeculae of the iliac crest were always thin suggesting the presence of osteoporosis as well as osteomalacia Two patients had hepatocellular jaundice and gave only a six month history but in the others jaundice had been present for three years or more. One patient had compression fractures of the vertebrae rib fractures bone pains and absorption of bone from the alveolar margin Within two to three years a severe thoracic kyphosis developed (Figs 184 and 185)

Intramuscular vitamin D appeared to have cured one patient with osteomalacia and to have relieved bone pains in another with osteomalacia and osteoporosis In one the osteomalacia did not progress Two patients with osteoporosis and one with osteoporosis and osteomalacia deteriorated despite treatment.

Bone disease is common in obstructive jaundice of over two years duration and the bone lesion may be osteomalacia or osteoporosis or both

Studies of Adrenal Hyperfunction in Two Patients with Atypical Cushing's Syndrome were made by Raymond C Mellinger and Richmond W Smith Jr[2] (Henry Ford Hosp) The variation in both clinical and biochemical response to administered adrenal steroids or corticotropin suggests that naturally occurring adrenal hypercorticism might not always be manifested as fully developed Cushing s syndrome. Until recently the diagnosis of adrenal hyperfunction depended chiefly on typical clinical findings since analytic methods for the corticosteroids were not quantitatively reliable Within the past few years newer methods of steroid analysis were developed which permit a more accurate measure of cortical function

One procedure was used extensively in evaluating many patients with one or more of features of Cushing s syndrome. Two were observed with a clinical syndrome of marked atrophy of the bones muscles and skin but without other fea-

(2) J Clin Endocrinol 16:350-366, March, 1956

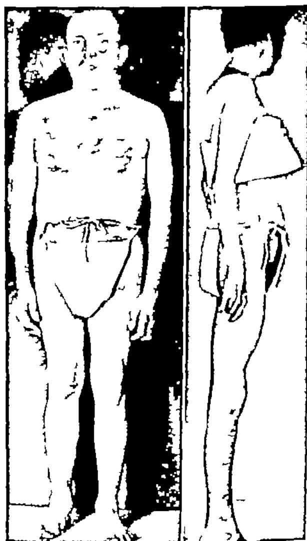


Fig 186. Fig 187

(Courtesy of Mellinger R. C and Smith, R. W J : J Clin. Endocrinol. 16:350-366, March, 1956.)

tures commonly observed in Cushing s syndrome There was no moon face or buffalo hump present (Figs. 186 and 187)

The adrenocortical hyperfunction in the two patients was characterized by excessive 17 hydroxycorticoid excretion with either a relative or absolute decrease in protein anabolic adrenal steroids The urinary 17 hydroxycorticoid level was clearly elevated in one patient The metabolic de-

rangement was established in the other by the demonstration of a high 17 hydroxycorticoid-creatinine ratio (steroid index) Both patients responded to small doses of corticotropin with increases in 17-hydroxycorticoid excretion

This increased sensitivity of the adrenal cortex is interpreted to mean that endogenous corticotropin levels are normal or low in these patients and that the primary derangement is probably adrenocortical hyperfunction Conversely in patients with pituitary basophilism the adrenocortical hyperfunction is thought to be secondary to increased elaboration of corticotropin and the response to administered corticotropin is *not* greater than normal Both patients underwent bilateral total adrenalectomy successfully Adrenocortical hyperplasia was found *in* both

Vitamin D Resistant Osteomalacia or Milkman s syndrome according to Bodil Nexmand Hauge[3] (Drammen Norway Hosp) is of unknown etiology and usually regarded as a form of osteomalacia. There is a presumed resistance to vitamin D and the condition has been compared to the vitamin D resistant rachitis that occurs in childhood The biochemical and histologic findings are identical to those seen in other forms of osteomalacia

Woman, 55 had Milkman s syndrome for 17 years Osteomalacia was diagnosed after histologic examination of a rib For many years blood tests showed normal serum calcium slightly reduced phosphorus and increased alkaline phosphatase—characteristics of osteomalacia. X ray examination of the skeleton revealed highly reduced calcium content (Fig 188, p 286) and Looser's zones. Pain and tenderness, localized to the bones were intensified on movement and pressure. Finally she was totally bedridden and subsequently died of a malignant neurinoma. Autopsy showed osteomalacia with Looser's zones. No connection between the osteomalacia and malignant neurinoma was revealed Despite a therapeutic positive calcium balance there was no clinically or roentgenologically *demonstrable* improvement.

Milkman s syndrome is compared with pseudohypoparathyroidism In both conditions there is an abnormal resistance to vitamin D and the parathyroid hormone respectively

---

(3) Acta med scandinav 153 271 282 1956

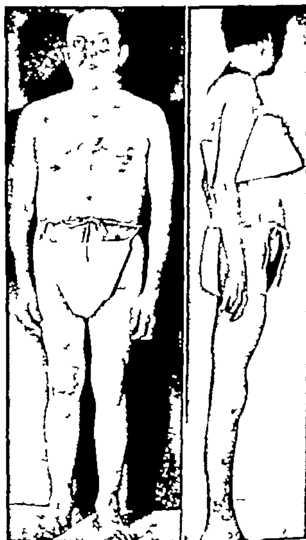


Fig. 186. Fig 187

(Courtesy of Mellinger R. C., and Smith, R. W Jr J Clin. Endocrinol 16:350-366, March, 1956)

tures commonly observed in Cushing s syndrome. There was no moon face or buffalo hump present (Figs 186 and 187)

The adrenocortical hyperfunction in the two patients was characterized by excessive 17 hydroxycorticoid excretion with either a relative or absolute decrease in protein anabolic adrenal steroids The urinary 17 hydroxycorticoid level was clearly elevated in one patient The metabolic de-

tabolites The lesions in most cases are spinal causing backaches that force the patient to seek advice more often from a rheumatologist than from a gynecologist In general the symptoms are commonplace but their localization in the lumbosacroiliac and mid-dorsal regions between the 4th and 7th dorsal vertebrae is distinctive Radiologic examination reveals no specific changes

All of the authors patients had had surgical castration (usually for fibroma) chiefly when they were aged 30 and 35 all had had painful menstruation few had had more than one child and some none at all A latent period of about 10 years had generally elapsed before the painful syndrome became fully established Because of the persistence of estrogenic activity as shown by the increased elimination of the phenolsteroids and a lowering of the 17 ketosteroids it seemed illogical to give estrogens to these patients who already had an excess of estrogen and it was decided to try androgens The first preparation used successfully was testosterone propionate in doses of 300 mg /month but further experimentation showed that enanthate of testosterone in one monthly injection of 250 mg was sufficient

The effect of the androgens is rapid pain disappears in a few days and the patient is able to resume activities for which she was incapacitated often for many months The treatment however has no effect on the vertebrae even after seven years some patients still showed the same osteoporotic lesions After three or four years on androgens the pains disappeared completely and no further androgen supplements were needed Apparently the severe painful crises caused by castration osteoporosis are transient

► [Treatment of osteoporosis in the older patient by sex gland hormones relieves pain and appears to improve the protein content of the bones but it does not lead to normal recalcification or the building-up of the opaque calcium salts in the bone. There must be an additional factor which is active in the production of senile osteoporosis.—Ed.]

Observations on Osteitis Deformans of Paget are reported by Walter Mercer and Robert B Duthie[5] (Univ of Edinburgh) Paget s disease is slightly more common in men than in women and usually appears in late middle age Pain is the leading symptom in 30% of patients Headache is a common complaint if the skull is involved The solitary le

(5) J Roy Coll. Surgeons, Edinburgh 1 58 74 September 1955



Fig. 188.—X ray of right humerus. (Courtesy of Hauge B. N.: Acta med. scandinav. 153:271-282, 1956.) (See p. 285.)

Castration Osteoporoses. According to A. J. Bret and M. Bardiaux[4] (Paris), certain osteoligamentary and osteoporotic manifestations may appear in women who have been castrated. The typical biologic anomaly found in castration osteoporoses is a persistent excretion of the estrogen me-

(4) Presse méd. 64:205-207, Feb. 4, 1956.

tion If at all possible sarcomas should be resected and the part replaced by an acrylic prosthesis

Osteochondrodystrophy as Result of or in Relation to Pseudohypoparathyroidism. Pseudohypoparathyroidism is characterized by short stature round face short thick neck

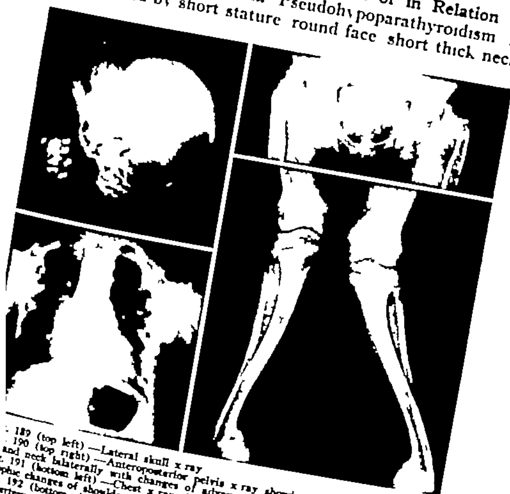


Fig. 189 (top left) —Lateral skull x ray
Fig. 190 (top right) —Anteroposterior pelvis x ray showing deformities of femoral heads and neck bilaterally with changes of advanced osteochondrodystrophy
Fig. 191 (bottom left) —Chest x ray showing narrowing of chest and osteochondrodystrophic changes of shoulder regions.
Fig. 192 (bottom right) —Anteroposterior x ray of both lower extremities
(Courtesy of Garceau, G J and Miller W E. J Bone & Joint Surg 38-A 131 141 January 1956.)

and short fat hands The fingers are short and occasionally rounded due to early closure of the epiphyses The long bones are short in relation to the trunk Soft tissue calcification is present To justify a diagnosis the patient should have chronic tetany The kidneys usually function normally George J Garceau and Wallace E Miller[6] (Indiana Univ)

(6) J Bone & Joint Surg 38-A 131 141 January 1956

sion—as commonly seen in the upper end of the tibia and in the calcaneum—progresses to generalized disease in about 75%

The x ray features include thickening broadening and elongation of the cortex—a process of hyperostosis modification of the structure of the cortex with trabecular formation increased transparency of the bone increased density and the appearance of such complications as stress or complete fractures concomitant arteriosclerosis osteoarthritis and sarcomatous degeneration

Although there is great activity in both calcium and phosphorus metabolism the equilibrium of these substances in the blood is maintained and serum levels are normal

The polyostotic lesions of Paget s disease can be differentiated from the generalized chondro- and osteodystrophies, the hyperparathyroidism of Recklinghausen multiple myelomatosis or eosinophilic granulomas by x ray biochemical and histologic examination However a single lesion, especially in the pelvis may be difficult to distinguish from a malignant metastasis The raised serum alkaline phosphatase may help in this differentiation

In generalized osteitis deformans the signs of cardiac failure are venous congestion tachycardia a high pulse pressure and a cardiac output as high as 13.3 L/minute. Nevertheless an obvious arteriovenous communication has not yet been demonstrated

Brailsford regards the disease as a primary localized vascular disturbance with a secondary adverse effect on the bone The vascular disturbance is considered to be produced by some form of an arteriovenous malformation not yet demonstrated

Pathologic fractures occur in about 20% of patients usually in the weight bearing long bones either as a partial stress fracture or a complete fracture as commonly seen in the femoral neck The statistical incidence of sarcomatous degeneration is about 2%

Fractures are treated along the usual lines to secure complete immobilization Collapse of vertebrae may require operative decompression for nerve root involvement and this should be supplemented by some form of fusion opera

present a patient with pseudohypoparathyroidism and bone changes which are difficult to explain unless one assumes the presence of an osteochondrodystrophy

Girl 5½ had hip knee and ankle deformities eight months before examination. Difficulty in walking was the chief complaint. Examination showed an enlarged head mottled teeth severe genu valgum and flaring and irregular epiphyses The condition resembled dyschondroplasia, and a series of osteotomies was begun. Five years later the patient was rehospitalized with mild tetany laryngeal stridor, carpopedal spasm vomiting a positive Chvostek sign and general acute illness. The tetany was relieved by intravenous calcium gluconate and a high calcium diet with oleum percomorphum was started. Laboratory studies revealed serum calcium 4.6 mg./100 ml., serum phosphorus 6 mg./100 ml serum alkaline phosphatase 77 King Armstrong units and urine calcium 5.3 mg./24 hours. The Sulkowitch test was negative A month later the serum calcium was 8 mg./100 ml., serum phosphorus 6 mg./100 ml and serum alkaline phosphatase 71 King Armstrong units. The bony changes are shown in Figures 189-192.

Tetany recurred a few months later and blood studies revealed calcium 9.7 mg./100 ml., phosphorus 5.7 mg./100 ml. and an alkaline-phosphatase level of 55 King Armstrong units/100 ml. An ECG showed calcium deficiency All previous physical and x ray signs were exaggerated. Biopsy revealed cortical bone with the appearance of osteomalacia. For the next year oleum percomorphum and dicalcium phosphate with viosterol were given. A slow progression of deformities was evident, but no further tetany For the next 18 months, 2.5 ml of A T 10 was given daily after which the deformities improved. Several months later skull x rays showed circumscribed areas of calcification and there were multiple calcific densities in the left kidney parenchyma. Urinary tests showed normal values. X rays of the long bones continued to show some demineralization, but the progress of the deformities was controlled.

GERIATRIC ORTHOPEDICS

Use of Vitamin Therapy to Reverse Certain Concomitants of Aging William Kaufman[7] (Bridgeport Conn.) studied 663 medical patients aged 4-80 treated with niacinamide (alone or with other vitamins) for a few months to nine years Without exception those taking 900-4 000 mg niacinamide in divided doses/day (alone or with other vitamins) had a clinically significant measurable improvement

(7) J Am Geriatrics Soc. 3:927-936 November 1955

tal weight bearing on fractures in the lower extremity is a principle which I have believed in and followed for many years and have had no cause to regret.—Ed.]

Osteoporosis—Geriatric Problem was studied by A M Rechtman M William Yarrow and S M Albert[9] (Philadelphia) Osteoporosis occurs oftenest after age 50 when normal osteoblastic function may be less active because of hormonal changes particularly in women following the menopause so that some degree of osteoporosis may be considered physiologic It is mainly a disorder of protein metabolism and only secondarily concerned with calcium phosphorus and alkaline phosphatase activity Bone production is at a minimum in osteoporosis Microscopically there are few osteoclasts and osteoblasts are rare The prime factors influencing osteoblastic activity are steroids mechanical stresses and strains nitrogen building blocks and perhaps an unknown fourth factor

Postmenopausal osteoporosis is the commonest of the systemic osteopathies At this age the decline in estrogen production may induce decrease in protein metabolism and result in decreased osteoblastic activity with inadequate bone formation In senile osteoporosis the symptoms become manifest after 65 The authors found a 25% incidence among the aged Generalized osteoporosis often occurs in older people who are bedridden Cushing's syndrome acromegaly hyperthyroidism and avitaminosis may be associated with osteoporosis

On x ray study osteoporosis which is a process of deossification not decalcification is frequently seen in the pelvis spine and femur When there is a fracture union tends to occur though more slowly than in normal subjects In the spine, the disk spaces are usually biconvex because the disk with its nucleus pulposus expands to compress the adjacent surfaces of the deossified vertebral bodies These in turn appear biconcave Compression fractures of the vertebral bodies may occur Differential diagnosis includes hyperparathyroidism osteitis deformans osteomalacia multiple myeloma and compression fracture of the vertebral bodies

Treatment includes exercise proteins vitamins and hor-

(9) J Am. Geriatrics Soc. 4 70 74 January 1956

assist in active movements Passive flexion and extension of the hip should be avoided Routinely no other exercises around the involved hip are indicated or needed for the average old person The average patient may sit in a wheel chair and start exercises within 24 hours postoperatively

The carefully graduated exercises that must precede crutch walking involve a three point gait with limited weight bearing on the injured leg The two main stages preceding training on crutches are independent standing on the good leg with only slight tiptoe weight bearing on the involved leg and walking between parallel bars with this same limited weight bearing Concomitantly the patient is instructed in power building push up exercises for the upper extremities

For the average patient, limited weight bearing seems to have no deleterious effect on maintaining alinement of the fracture site except in a few instances Slipping of the proximal part of a nailed fracture is not an argument against limited weight bearing

The classic three point crutch walk with limited weight bearing is performed in such a way that the patient standing on the good leg and tiptoeing with the involved leg puts both crutches forward simultaneously then advances the involved leg with the toes close to the line in between the crutches and with the weight of the body on the crutches and swings the good leg through In old people this gait is subject to many modifications

Full weight bearing is allowed in accordance with x ray appearance and type of hip fracture The author allows full weight bearing usually only after four or five months Once it is allowed the patient should be given an opportunity to discontinue the use of crutches gradually in a supervised manner Physical therapy should not be discontinued until a permanently safe walking pattern is established.

► [The controversy between the advocates of rigid immobilization of fractures and those who believe that a little movement at the fracture site not only will not prevent healing but may stimulate callus formation will probably never be resolved. The successful healing of thousands of fractures of the humerus treated by the hanging cast, which does not rigidly immobilize and does not prevent some movement at the fracture site until the fracture itself is sufficiently healed to produce stability would seem to be sufficient argument for the principle of early ambulation. Activity under the supervision of physician or physical therapist and, whenever possible, par

▶ [The importance of exercise in prevention or treatment of osteoporosis cannot be overemphasized. If active exercise cannot be accomplished, the rocking bed should be used. The mucosa of the senile bowel may be atrophic. In addition to hormones, vitamin D in a solvent that is easily absorbed should be prescribed. Absorption is most readily accomplished if the vitamin D is in an alcohol solvent such as propylene glycol.—Ed.]

Relation of Dietary Intake to Bone Fragility in Aged was studied by Olive B Hayes, Lucille J Bowser and Martha F Trulson[2] (Harvard Univ.) Dietary histories of 16 men and 31 women hospitalized because of fractured femurs were compared with those of 47 controls in an attempt to determine the extent of influence of dietary intake on development of bone fragility in the aged. All persons were over age 65 and no person with a physical handicap that prevented at least moderate activity for his age was included. No significant differences in adult eating habits or in milk intake during childhood were noted between the two groups. Those with a fracture of the femur tended to be somewhat underweight compared with those without history of broken bones. The study suggests that onset of bone fragility in the aged is a composite effect of many factors and is probably more intimately related to endocrine changes, decreased activity and loss of muscle tone than to level of nutrition.

▶ [The conclusions of these authors merely confirm what most of us have believed for a long time. Dietary intake has very little to do with bone fragility or osteoporosis of the aged patient. Inability of the patient to properly digest, absorb and utilize the nutritional elements from the alimentary tract because the mucosa is atrophic, hepatic insufficiency and other deficiencies of the digestive system are more important factors. The role of the endocrine glands, particularly the sex glands, is important in maintenance of good protein metabolism and hence of a good matrix in the bones.—Ed.]

MISCELLANEOUS

Ainhum. This chronic disease characterized by a groove around the base of a digit, usually the fifth toe, leading to eventual spontaneous amputation is unusual in natives of the United States. Robert L. Chancey and Bernard F. Gip-n[3] (U.S. Air Force Hosp., Lowry Air Force Base, Colo.) report a case

---

2 J. Gerontol. 11 154-159 April, 1956
3 U.S. Armed Forces M. J. 7 101 104 January 1956.

mones The authors give 1.25 mg premarin® and 10 mg methyltestosterone orally twice a day for one week, then once a day for three weeks with a rest period of a week, when a second course is begun if necessary After this dosage has been given for about two weeks or when the subjective annoyance has improved the dose may be halved for maintenance therapy Estrogen affects calcium retention whereas androgen mainly affects nitrogen retention Orthopedic measures help to relieve strain spasm and pain

Pathogenesis and Treatment of Senile Osteoporosis are reported by Marc Moldawer[1] (Harvard Univ) Osteoporosis is a disorder of the protein matrix of bone and not primarily a derangement of calcium metabolism The primary problem is decrease in bone matrix production Decreased activity possibly undetected dietary insufficiencies and a hormonal balance favoring antianabolism are some of the etiologic factors

The aim of all treatment is rapid and complete mobilization After a fracture the acute pain often subsides spontaneously but even during this time it is wise to encourage activity if at all possible To provide support without fixation a corset rather than a brace or occasionally a light partial back brace is suggested Once mobilization is effected, a systematic program of physical therapy is begun with mild exercises and some walking each day

In women once diagnosis is made treatment is begun with both estrogen and androgen Diethylstilbestrol (stilbestrol) 1 5 mg daily is given for 4-5 weeks and then omitted for 7 10 days Methyltestosterone, in linguets is the male hormone most often used 5 10 mg being given daily or every other day for four to eight weeks or until signs of masculinization become troublesome The combination of estrogen and androgen appears to slow the rate and degree of masculinization

In men treatment is usually begun with both estrogen and androgen The androgen is continued indefinitely and the estrogen until side effects become disturbing 2 or 3 10 mg linguets of methyltestosterone may be given daily

(1) Geriatrics 11 319-331 August, 1956.

in their bodies as the first group The mean age at the time of deposition for the luminous dial workers was 21, contrasted with 36 for the patients who had been given radium Almost no clinical changes and no tumors developed in any patients who had under 0 5 µg of retained radium In addition there were almost no x ray changes in the few patients who had under 0 5 µg of radium and in whom deposition occurred as much as 30 years before A proportionate increase in severity of the clinical changes with increasing amounts of radium in the body was not found However there was a marked variation in clinical response when related to amount of radium in the body A definite correlation existed between the frequency of skeletal x ray changes and tumor formation and the retained radium within a certain range Anemia was not pronounced

Radium is deposited in small highly concentrated areas irregularly distributed throughout the skeleton The concentration of radium in samples from various parts of the skeleton in one patient varied by a factor of 10 Probably the radium concentration in some of the haversian systems will have many times the upper limits of these variations because of the inherent difficulties in bone sampling

Atypical osseous tissue in trabecular spaces is characteristically found on histopathologic study after deposition of radioactive elements Small areas of increased density were found in cancellous bone on skeletal x ray examination as a result of the atypical osseous tissue Small well differentiated areas of destruction were found in compact bone These changes developed years after the deposition of radioactive elements In the autoradiographic and histopathologic studies on bone specimens radium was found as often in the absence as in the presence of histologic change Because of this lack of correlation of the deposition of radioactive elements and pathologic change it is considered that the deposited radioactive elements initiate a sequence of events that eventually produce pathologic alterations

Destructive effects of deposited radioactive elements made the skeleton more fragile so that aseptic necrosis and fractures of the bones subjected to the greatest stress frequently occurred

Negro youth 18 hospitalized because of painful right little toe, had spent most of his life in the midwestern United States. About five months before he had an "infection of both feet. A few days later he noted pain on motion of the right fifth toe. Shortly after this he noted at the base of the toe a small crease, that gradually progressed until a deep groove involved the entire circumference of the base. Examination revealed a deep fissure involving the base of the right fifth toe but no evidence of any acute process involving the groove. The left fifth toe appeared normal Results of oscillometric studies of the lower extremities were normal. X rays of the right foot showed bony atrophy of the distal portion of the fifth proximal and distal phalanges. The toe was amputated. Histologic picture was nonspecific. Diagnosis was ainhum

The study supports the view that ainhum is a symptom that may occur in many conditions and not a primary disease

Late Effects (25-40 Years) of Early Medical and Industrial Use of Radioactive Materials Their Relation to More Accurate Establishment of Maximal Permissible Amounts of Radioactive Elements in the Body III If enough radium is present in the body to produce clinical changes it can be detected by radiochemical analysis of the feces collection of radon in the breath or external counting The history of radium intake and the characteristic skeletal x ray changes are usually sufficient for diagnosis of the deposition of radioactive elements The amount of radium remaining in the skeleton was estimated by measuring the amount of radon in the breath and the gamma ray activity given off by the body Almost all radium is rapidly eliminated so that at one year only about 0 1 10% of the initial amount is still present The coefficient of elimination after 20 years is about 0 02-0 016% of the body content.

W B Looney[4] (Nat l Naval Med Center) evaluated 50 patients who were given radium salts orally or intravenously for medical purposes and 28 luminous dial workers who ingested or inhaled radium mesothorium radiothorium or all three The patients were divided into two groups and the time from deposition of radioactive elements until symptoms developed was compared Average time for symptoms to occur in the two groups was about 15 years even though the second group had 10-100 times as much retained radium

(4) J Bone & Joint Surg 38-A:392-406 April, 1956

finger nails Radiologic study of the hands showed periosteal proliferation in the form of spicules around the diaphyses of the metacarpals and phalanges (Fig 193) Ensheathing periostitis around the bones of the forearm was clearly visible (Fig 194) X rays of the chest revealed a diffuse hilar and perihilar opacity on the left General condition did not permit bronchoscopy but on biopsy a cervical nodule was found to be a spinocellular metastasis probably of bronchial ori-



Fig. 195 (Courtesy of Roussel, J., *et al* J radiol. et électrol. 36:718-723 1955)

gin In another patient a miner aged 50 the thoracic lesion (Fig 195) was found to be a voluminous peripheral pulmonary tumor extending to the pericardium and the pleura

The complete syndrome may be summarized as a combination of arthralgia evident periostitis a distant tumor and hippocratism Joint pains usually lead the patient to seek medical advice well before clinical signs of tumor appear The tumor in most cases seems to be a bronchial adenoma in an advanced stage In addition to the complete syndrome there is apparently an incomplete form that passes unnoticed because the joint pains are entirely lacking in this form the bone lesions seen in x ray films are much less

It is felt that the relation between the destructive effects of radioactive elements remaining in the body for long periods and the clinical changes produced is a dynamic relation between destructive and reparative processes of the body

Management of these patients consists primarily in vigilance in regard to development of malignant tumors and orthopedic care for skeletal lesions

Observations on Pierre Marie Disease According to J Roussel P Schoumacher and Pernot [5] Pierre Marie dis-



Fig 193 Fig 194
(Courtesy of Roussel, J et al J radiol. et électrol. 36:718-723 1955)

ease which is rare and of uncertain pathogenesis is characterized by (1) clinical signs (digital hippocratism and rheumatic like pains in the extremities) (2) radiologic signs (ensheathing periostitis) and (3) remote lesions (most often chronic lung disease) Patients with this disease recently observed by the authors included a woman aged 54 whose illness began with pain in the knees and metacarpophalangeal joints Clinical signs were arthralgia thickening of the finger tips with digital hippocratism and watch crystal

(5) J radiol et électrol. 36 718-723 1955

finger nails Radiologic study of the hands showed periosteal proliferation in the form of spicules around the diaphyses of the metacarpals and phalanges (Fig 193) Ensheathing periostitis around the bones of the forearm was clearly visible (Fig 194) X rays of the chest revealed a diffuse hilar and perihilar opacity on the left General condition did not permit bronchoscopy but on biopsy a cervical nodule was found to be a spinocellular metastasis probably of bronchial ori



Fig 195. (Courtesy of Roussel, J., et al. J radiol. et électrol 36 718-7-3 1955)

gin In another patient a miner aged 50 the thoracic lesion (Fig 195) was found to be a voluminous peripheral pulmonary tumor extending to the pericardium and the pleura

The complete syndrome may be summarized as a combination of arthralgia, evident periostitis a distant tumor and hippocratism Joint pains usually lead the patient to seek medical advice well before clinical signs of tumor appear The tumor in most cases seems to be a bronchial adenoma in an advanced stage In addition to the complete syndrome, there is apparently an incomplete form that passes unnoticed because the joint pains are entirely lacking in this form the bone lesions seen in x ray films are much less

pronounced This minor syndrome which was present in four patients includes mild periostitis distant tumor and hippocratism Borderline cases in which small spicules may be found in the metaphysial-diaphysial region of the first phalanx, may present a delicate diagnostic problem when pictures of this kind are associated with clearcut chronic rheumatic manifestations and there is no distant tumor differentiation from the forme fruste of Pierre Marie disease is warranted Digital hippocratism is constant in Pierre Marie disease but since it also appears in many other conditions, whether tumoral or otherwise which are not accompanied by periostitis it does not seem to be one of the essential elements of the syndrome Ordinary hippocratism of the fingers occurring in the course of thoracic disease is only exceptionally accompanied by periosteal lesions

► [The condition which has been discussed as Pierre Marie disease is most often spoken of in the United States and other English-speaking countries as pulmonary osteoarthropathy —Ed]

Unusual Cases of Osteomyelosclerosis In osteomyelosclerosis the red bone marrow fills to a varying extent with calcified connective tissue X rays show diffuse or more localized sclerosis of the bones Such lesions may occur after irradiation or as a result of the action of benzene or fluorine but in most cases the cause of the sclerosis is unknown In primary or idiopathic cases there is perhaps a question of an allergic reaction of the bone marrow Primary osteomyelosclerosis is often accompanied by splenomegaly sometimes also hepatomegaly signs of hypersplenism and moderate leukocytosis with a myeloid blood picture Aage Videbaek[6] (Univ Hosp of Copenhagen) reports three typical cases of diffuse osteomyelosclerosis In the first patient it coexisted with chronic lymphogenous leukemia (Fig 196) in the second with typical myelomatosis and in the third with chronic myelogenous leukemia with up to 300 000 myeloid cells in the blood The common features in all three cases were radiologic signs of myelosclerosis and splenomegaly

Myelosclerosis apparently can occur concomitantly with various diseases of the hemopoietic tissues Long standing cases of polycythemia vera may also end in osteomyelosclerosis

(6) Acta med scandinav 153 459-465 1956.

rosis. In most cases the primary phenomenon is presumably a connective tissue disorder accompanied by myeloid metaphasia and by more or less myeloid blood picture. In a few instances, however, myelosclerosis appears to have been a



Fig. 196.—Pelvic bones showing diffuse osteosclerosis in case of chronic lymphogenous leukemia. (Courtesy of Videbaek, A.: Acta med. scandinav. 153:459-465, 1956.)

consequence of a diffuse process in the hemopoietic tissues of the bone marrow.

Exchange of Views on Case of Osteopecilia. In examining x-rays made in the case of a woman aged 63 with pain in the knees, A. Sarazin[7] (Angers, France) accidentally discovered the rare striated form of osteopecilia first described by Voorhoeve in 1924. The pains, present almost from adolescence, had always been attributed to rheumatism, from which the brother and two sisters also suffered. She had entered a religious community and had led an arduous life both in the dispensary and clinic, finally occupying the position of infirmarian in a tuberculosis service. She then became ill with pleurisy, which was followed by a cardiac le-

(7) J. radiol. et électrol. 36:881-885, Nov.-Dec., 1955.

sion As the brother and sisters had no history of tuberculosis, the pleuritic illness was probably due to the work and had no connection with the bone anomaly In answer to an inquiry the physician of the patient reported that she had resumed active work as a nurse in a country locality general health was fairly good but she still showed arthritic



Fig. 197 —X rays (frontal and lateral) of left knee. (Courtesy of Sarasin, A. J radiol. et électrol 36 883-885 Nov Dec. 1955)

lesions especially in the knees though the other joints were also affected and there was even some vertebral involvement. This information was not very detailed but because of religious status she was never willing to have an examination unless absolutely necessary

In the x rays osseous striations were most distinct in the knee (Fig 197) which was the first part to be studied because it presented the most intense arthritic disturbances. Similar striations were also found in the pelvis and forearm, they were especially clear in the femoral neck on both sides



Fig. 198.—Patient at age 3 months, with bilateral facial swelling more marked on right. (Courtesy of Allen, D. H., *et al.*: Am. J. Roentgenol. 76:576-582, September 1956.)



Fig. 199.—Tarsal bone involvement at age 8 months. (Courtesy of Allen, D. H., *et al.*: Am. J. Roentgenol. 76:576-582, September 1956.)

findings and onset before the sixth month of life were characteristic. Termination of this process by death is unusual although in this patient death was attributed to the cerebral abnormality

Infantile cortical hyperostosis should be differentiated from hypervitaminosis A While the former is accompanied by fever mandibular involvement and normal vitamin A blood level in the latter fever and mandibular involvement are absent the vitamin A blood level is elevated and a low vitamin diet ameliorates the symptoms within one week

Reconstruction of Temporomandibular Joint is discussed by Edward C Hinds and John E. Pleasants[9] (Houston) A



Fig. 200 (left) —Preoperative view closed mouth position showing open bite.
Fig. 201 (right) —Postoperative view showing elimination of open bite
(Courtesy of Hinds, E. C and Pleasants, J E. Am J Surg 90 931-939 December 1955)

nonfunctioning temporomandibular joint may be due to ankylosis after infection or trauma traumatic injuries resulting in fracture of the neck of the condyle or dislocation or both and arthritis particularly of the rheumatoid type.

Most procedures presently used for relief of ankylosis of the temporomandibular joints are successful immediately after surgery however complications of facial deformity malfunction and malocclusion could be prevented by reconstructing the joint at the time of original surgery Plastic procedures to restore facial contour after condylectomy or resection of a part of the ramus of the mandible do not in

(9) Am. J Surg 90 931-939 December 1955

any way relieve malocclusion or restore temporomandibular joint function

Three cases are presented in which the temporomandibular joint was reconstructed using cartilage and securing it in place with a Kirschner wire In one it was necessary to free the joint space surgically as much as possible and apply constant traction attached to a Steinmann pin drilled through the symphysis to pull out the mandible (Fig 202) The results were satisfactory (Figs 200 and 201) After reconstruction of the temporomandibular joint it is advisable

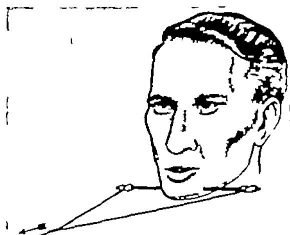


Fig 202—Attempt to move mandible into normal position with traction. (Courtesy of Hinds, E. C and Pleasants, J E.: Am. J Surg. 90:931 939 December 1955.)

to immobilize the jaws three to four weeks for healing and the formation of scar tissue around the newly created joint For reconstruction autogenous cartilage is the material of choice

Surgical Reconstruction of Temporomandibular Joint. Orion H Stuteville and Robert P Lanfranchi[1] (Chicago) found that fractures of the condyle ankylosis and destruction of the condylar growth center may alter the anatomic configuration of the temporomandibular articulation and have a deleterious effect on its function

Extracapsular condylar fractures in which the head has been torn from the capsule and displaced medially should be treated by open reduction and replacement of the condyle

(1) Am J S g 90 940-950 December 1955

into its normal anatomic relationship If it is necessary to remove the condyle some provision must be made to reconstruct the joint by means of a bone graft cartilage graft or prosthetic implant The second metatarsal bone can be used as a graft to replace the mandibular condyle Also it may be possible to substitute the growth potential of the head of a metatarsal for that of the condyle

Two cases of ankylosis of the temporomandibular joint due to old injury are presented In one the mandible neck was sectioned 1 cm below the temporal bone and the bulbous condylar fragment was removed Cartilage taken from the rib was placed into the glenoid fossa The cartilage graft was taken proportionately larger than the condyle that was removed to compensate for some of the mandibular growth loss and thereby return the chin to its normal position The cartilage graft was held in position by wire sutures A pressure bandage was applied to the area and on the day after operation the patient began chewing In the other patient pseudoarthrosis was established by the following method The ramus of the mandible was sectioned below the mandibular notch cut about 3 mm wide A wedge of cartilage about 6 mm thick was forced into place between the cut surfaces of the bone and secured with catgut suture. The wound was closed and a pressure dressing applied to the areas of surgery The patient was encouraged to begin chewing the next day

A new surgical procedure was used in a third patient.

Girl, 7 could not open her mouth widely because of an old injury X rays showed a large condyle on the left side with no joint space. The temporomandibular joint was exposed the condyle was ankylosed to the temporal bone. The mandibular neck was sectioned with a surgical bur about 5 mm inferior to the temporal bone. The proximal part of the condyle was separated from the temporal bone with an osteotome and mallet and the condyle was removed The head of the metatarsal bone was placed into the glenoid fossa the opposite end was attached to the mandible with stainless steel wire The wound was closed and pressure dressing applied. Immediately after surgery the patient was able to open her mouth 3 cm

Meniscus Injuries of Temporomandibular Joint, according to Caroll M Silver Stanley D Simon and Americo A Savastano[2] (Providence R I) commonly cause pain snap-

(2) J Bone & Joint Surg 38 A 541 552 June 1956

ping crepitation and locking of the jaw The last usually occurs when the *mouth* is closed and often patients complain of such peripheral symptoms as dull pain within or about the ear, tinnitus pain referred to the top of the head or side of the jaw burning or prickling of the tongue and a metallic taste in the mouth

Examination usually reveals a limited mouth opening tenderness directly over and snapping and crepitation in



Fig. 203 —External pterygoid inserts into anterior capsule and articular disk and pulls latter forward when mouth is opened. (From Wakeley, C. Ann. Roy Coll. Surgeons 2 120 1948.) (Courtesy of Silver C. M., *et al* J Bone & Joint Surg. 38-A 541 552 June 1956.)

the affected temporomandibular joint Often the jaw is deviated toward the involved side due to impairment of the gliding motion of the joint with resultant shift of the mandible.

The external pterygoid muscle inserts into the anterior capsule and anterior part of the articular disk (Fig 203) causing the forward movement of the disk essential to the routine opening of the jaw A sudden or forceful contraction of the external pterygoid muscle can detach the thin posterior attachment which joins the articular disk to the capsule. The muscle fibers then draw the entire meniscus forward, lodging it anterior to the mandibular condyle where it acts

as a mechanical block preventing the normal gliding and hinge-action of the temporomandibular joint

A patient with an injury to the temporomandibular joint meniscus should be treated first by conservative means consisting of rest for the jaw avoidance of all hard chewy foods application of heat locally and sedation He should be cautioned against yawning widely In the present series, a number of patients were given intra articular injections of 0 5 cc. hydrocortone solution, with satisfactory response If con-



Fig 204 —Meniscus has been removed and is lying on gauze. Mandibular condyle may be seen in wound. (Courtesy of Silver C. M, *et al.* J Bone & Joint Surg 38-A:541 552, June, 1956.)

servative therapy fails meniscectomy of the temporomandibular joint is indicated The authors performed 44 meniscectomies with good results

During surgery the ear is left exposed in the operative field and a small sterile pledget is placed in the external canal providing a means of surgical orientation (Fig 204)

Delayed Ulnar Neuritis According to G W N Eggers[3] (Univ of Texas) neuritis of the ulnar nerve is mechanical and usually associated with bony trauma but occasionally only the soft structures are involved Etiologic factors in order of frequency are epiphysial damage with abnormal

(3) Nebraska M J 41:219 223 June, 1956.

growth of medial condylar area non and malunion of medial condylar and epicondylar area fractures of olecranon flexion deformity of elbow joint due to soft tissue restriction of extension and fibrosis of perineural channel

While there is pain in the forearm and discomfort in the arm and shoulder maximal discomfort is in the elbow joint. In the first years of the neuritis the pain is usually referred to the elbow joint. The commonest finding is that the patient had an elbow fracture during childhood with residual deformity The commonest deformity is a change in the carrying angle with overgrowth of the medial epicondylar area, which may or may not be associated with loss of elbow extension Some patients present only loss of extension due to injury in childhood or later

The etiologic factor is repeated mechanical restriction of the ulnar nerve as it passes through the tunnel of the medial epicondyle The constant stretching and irritation causes fibrosis of the perineural structures of the nerve, which in turn causes pain Later the nerve becomes affected, with resultant paraesthesias and ultimately with paralysis. Onset is insidious and goes on for years Most patients become convinced that they have traumatic arthritis which is the usual diagnostic error

Treatment consists of transplantation of the ulnar nerve anteriorly from the groove on the medial epicondyle of the ulna A curved incision anterior to the medial epicondyle exposing the ulnar nerve above the elbow is a satisfactory approach The nerve is best exposed proximal to the elbow joint and then removed from the tunnel As the flexor carpi ulnaris is reached care must be taken because the nerve divides into two branches The small articular branch of the nerve is sacrificed and the nerve placed anteriorly but the transplantation must be secure or the nerve may dislocate posteriorly later and cause difficulties Dividing the fascia of the flexor carpi ulnaris and placing the nerve in the muscular mass secures the transplantation and protects the nerve.

To prevent delayed ulnar neuritis in bony elbow injuries such as side-swipe elbow fractures requiring open reduction the ulnar nerve is transplanted routinely

Preliminary Study of Selective Plantar Muscle Denervation for Pes Cavus is described by George J Garceau and Malcolm A Brahms[4] (Indiana Univ) Pes cavus or claw-foot occurs in association with some neuromuscular disturbance causing muscle imbalance The deformity is often progressive and is usually difficult to correct The abductor hallucis flexor hallucis brevis flexor digitorum brevis and quadratus plantae are the chief deforming muscles

Selective plantar muscle denervation is suggested to prevent the progressive increase of pes cavus It will improve

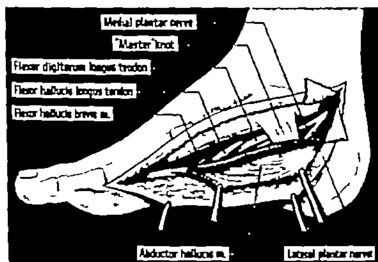


Fig. 205 —Abducto hallucis is reflected and incision made in laciniate ligament to expose medial and lateral plantar nerves. (Courtesy f Garceau, G. J and Brahms, M. A. J Bone & Joint Surg. 38-A.553-562, June, 1956.)

the foot balance, performance stability and position and these improvements stimulate better growth

Technic.—The incision follows the skeletal plane of the inner border of the foot. The fascial reflection of the abductor hallucis is incised and the muscle is reflected soleward. Two openings in the muscles are made, one distally between the abductor hallucis and flexor hallucis brevis and one posteriorly between the abductor hallucis and flexor digitorum brevis. The medial plantar nerve may be found inferior and lateral to the tendons of the flexor hallucis longus and the flexor digitorum longus (Fig 205) The nerve branches are stimulated and those which cause contraction of the muscle are severed for any muscle contraction increases the arch of the foot. The nerve is further followed and its branches to the flexor hallucis brevis and flexor digitorum brevis are identified and elevated. Again

(4) J Bone & Joint Surg. 38-A.553 562, June, 1956.

the branches are stimulated and those causing muscle contraction are severed The lateral plantar nerve is located by tracing the medial nerve posteriorly until it passes under the laciniate ligament. At this point the medial nerve is retracted either upward or downward. The lateral nerve in this area dips downward between the flexor digitorum brevis and the quadratus plantae in preparation for coursing laterally and obliquely across the sole. The small branches of the lateral nerve leading to the quadratus plantae are elevated and stimulated and those causing contraction of the muscle are severed.

The main trunks of both nerves are again stimulated to determine if the muscles can be contracted sufficiently to increase any cavus deformity that remains. If the results are positive, a search is made for motor branches that have not been severed. Only those which cause contraction of the muscles should be severed the others are purely sensory After the operation, the foot is immobilized in a plaster boot, usually for three weeks.

For most favorable results the operation should be done as soon as possible because as growth occurs the bones will be molded into a shape that conforms with the deformed position of the foot The operation is indicated if the deformity is congenital or if it results from infantile paralysis or clubfoot No ill effects were noted

Autonomic Hyperreflexia and Its Control in Patients with Spinal Cord Lesions is reported by N B Kurnick[5] (Univ of California Los Angeles) Somatic hyperreflexia following interruption by spinal cord lesions of inhibitory impulses from higher centers is well known There exists also an analogous autonomic hyperreflexia Since the major splanchnic outflow in this system is from the 4th or 6th thoracic to the 12 lumbar segments of the cord dramatic dysfunction of the autonomic system is seen primarily following lesions above this level i e. high thoracic and cervical cord lesions. At least 85% of quadriplegics show autonomic hyperreflexia characterized by paroxysmal hypertension

The visceral spasm (particularly urinary bladder) severe hypertension and resultant headache that these patients experience spontaneously and during bladder urethral and rectal manipulations are bars to effective therapy and rehabilitation Retinal hemorrhage and fatal cerebral and subarachnoid hemorrhage have been caused by the sudden rise in systolic blood pressure from the usually hypotensive level of the quadriplegic to pressure approximating 300 mm Hg

(5) Ann. I t. Med. 44:678-686, April, 1956.

Therapy designed to combat these difficulties must act at levels below the spinal lesion

Hexamethonium was given intravenously to 38 quadriplegics and orally to 33 others Satisfactory control was obtained in all but three Treatment was discontinued in three because of marked aggravation of pre-existing postural hypotension In four patients with midthoracic lesions bladder spasticity was controlled with small oral dosage Sympatholytic agents proved ineffective for control of paroxysmal hypertension

The effect of hexamethonium is probably due to diminishing the intensity of the reflex arc response by damping transmission across the autonomic ganglia

Immediate and Early Care of Traumatic Paraplegia is discussed by A Estin Comarr[6] (College of Med Evangelists) who stresses the importance of preventing complications Transportation of the injured person is done in the prone position with immobilization of the head if there is cervical injury Opiates are generally unnecessary and contraindicated particularly with high cervical injuries On hospitalization the bladder is catheterized with a 14 or 16 F Foley catheter X rays are taken and manometric studies are made of the cerebrospinal fluid Foster or Stryker frames are used For cervical fracture-dislocations skeletal traction seems preferable to head halters

The decision to do laminectomy depends largely on the presence of a cerebrospinal fluid block in the absence of such a block and/or bone encroachment, laminectomy is usually not indicated General care of the patient includes continuous catheterization of the bladder Further therapy to restore bladder function depends on the type and extent of the lesion initially all are treated similarly With no evidence of vesicoureteral reflux, tidal drainage and bladder training are started after recovery from laminectomy Physical rehabilitation begins simultaneously with medical rehabilitation and is of importance in preventing structural contractures

Improvement in function in various pathways of the nervous system consistently followed a certain order sug-

(6) West. J Surg. 63 732 741 December 1955

gesting that susceptibility to damage is inversely related to recovery Best return of function occurred within the posterior column pathways then in the spinothalamic components of the lateral columns and the least improvement was seen in the bladder pathways (possibly a combination of lateral and posterior columns)

Of the 858 spinal cord injuries reported in this series 579 patients had laminectomies Recovery in this group was poorer than in nonlaminectomized patients Of the total patients 10 6% were ambulant and 2 6% walked without aids

Management of Paraplegic Patient is reported by L Guttmann[7] (Nat l Spinal Injuries Centre Aylesbury England) A patient with a suspected spinal fracture should be warned not to move He should be moved slowly from the place of accident, with care not to bend him either backward nor forward All movements should be carried out simultaneously so that he is turned lifted or shifted as a unit. All patients with spinal injuries can be safely and comfortably transported in the supine position on a rigid stretcher or board Morphine is indicated only in presence of severe root pain

On hospitalization he is placed on "sorbo packs with one to three additional pillows underneath the fracture to produce hyperextension of the spine in the physiologic position From the supine position he is turned first on one side, the hyperextended position being maintained by using a sandbag to support the pillow in the back then back to supine position and then on the other side every two hours day and night The turning is done by several attendants, who move him simultaneously and as a unit With this method of postural immobilization and regular turning ordinary compression fractures of the spine can be kept safely in position and fracture-dislocations brought into satisfactory alinement

If voluntary or reflex function does not develop within 24-36 hours of spinal injury drainage of the bladder is indicated and is carried out by urethral catheterization under aseptic precautions with a nontouch technic Catheteriza

(7) Practitioner 176 157 170 February 1956.

tion is at first intermittent and later constant with an in dwelling catheter Antibiotics are given Bladder washouts or tidal drainage are necessary if infection sets in

Potential Reversibility of Hemiplegic Gait was studied by Walter J Treanor Robert B Pearson Raoul C Psaki and Ernst Dehne[8] (Letterman Army Hosp San Francisco) in 125 patients The individual components of the hemiplegic gait were postural hypertonus asynergia of laterally placed muscles delayed return of proximal groups and genu recurvatum

To alter the hemiplegic gait ambulation with the limb suitably splinted was encouraged throughout the stage of initial generalized hypotonia and until the extensor muscles were able to support the body weight Ambulation was severely curtailed throughout most of the rest of the recovery cycle certainly until a balance between the strength of flexor and extensor activity had been achieved In keeping with the policy of reducing afferent stimuli to the postural muscles retraining of the flexor synergy was emphasized At first, painful stimuli were combined with manual resistance to reinforce the response of synergic withdrawal in all the flexors Later re-education exercises were prescribed for individual flexor muscles of the knee foot and hip joints in that sequence Chemical and mechanical blocking of the nerves supplying the extensor groups was also used

Spontaneous recovery occurring within two to three months after onset accounted for most functional gains but extent and rate of spontaneous recovery could be significantly altered by more careful control of afferent influences acting on spinal integrator systems Limitation of standing and selective retraining of flexor activity resulted in earlier restitution of the gross flexor synergy and volitional control over individual flexor muscles The practice of blocking nerves was designed to decrease the danger that the weaker muscle might be ignored in the performance of motion patterns

Original Osseous Observation is reported by P Marques L Soubiran A Lestrade S Michalsky and Du Puy De Goyne[9] (Toulouse)

(8) U S Armed Forces M J 7 179 190 February, 1956.
(9) J radiol et électrol. 36 874 875 Nov Dec 1955

Man 39, sustained a fracture of the left femoral head during a fall. X ray revealed intertrochanter fracture (Fig 206) and muff shaped osseous lesions. The hip and knee joints were not involved. Opacity of the lesions was not homogeneous. They had a reticuloalveolar structure, with well defined limits and without geodes. An identical lesion about the size of a tangerine was seen in the soft parts. X rays



Fig 206.—Fracture of femoral neck clearly visible. Joint is free and diaphysis sheathed in proliferation, with well individualized formation at level of great trochanter (Courtesy of Marquès, P., *et al.* J radiol. et électrol. 36:874-875 Nov Dec., 1955)

of the right elbow which was partially blocked revealed the same process involving the lower two thirds of the humerus and elbow joint. This lesion also had well defined limits and a similar reticuloalveolar structure the only peculiarity being invasion of the joint. A film of the skull was not strictly in profile, and the image of the sella turcica was hard to interpret. Further x rays were impossible because of pain

No diagnosis was made because the multiple foci with well defined contours and integrity of the skull led to rejection of tumors of any

kind and presence of the lesion in the soft parts did not favor dystrophy Clinical findings were of little help but history revealed that, about 20 years ago he had had three fractures involving the right shoulder left leg and left elbow within a few months All three fracture sites appeared normal on palpation A certain degree of alcoholism made interrogation difficult

He was subject to epileptiform convulsions which had never been treated. A convulsive attack in the afternoon was followed by a syndrome of hyperthermia and extreme agitation and despite sedatives he died within two days A tissue specimen from the thigh opposite the fracture established the bilaterality of the process but since it was nonspecific, it had no diagnostic significance

As a hypothesis the authors suggest that the lesions may have been old calcified hematomas

Ehlers Danlos Syndrome The syndrome also known as cutis laxa and dermatolysis is an extremely rare congenital dysplasia of the mesenchyme involving connective tissue of skin subcutaneous tissue joint ligaments and musculature Clinical symptoms are (1) dystrophy of the skin which displays increased elasticity vulnerability and fragility of dermal vessels (2) deficiency of subcutaneous fatty tissue (3) looseness and hyperextensibility of joint capsule and ligaments and (4) hypotony of skeletal musculature Hyperflexibility of joints results from hyperelasticity of capsule and ligaments and is increased by hypotony and hypoplasia of skeletal muscles In isolated cases loss of muscular tone is similar to that in myasthenia or myodystrophy but muscular hypotony is usually not a major symptom H J Dammermann and W Müller[1] (Hamburg) report a case

Girl, 16 was normally developed with no gross deformities or anomalies but had been hospitalized 17 times during the past five years for frequently recurring skin injuries and had received ambulant treatment for minor injuries. No other members of the family were similarly affected. The bridge of the nose was perhaps wider than normal, with greater distance between the eyes (this has been cited as pathognomonic of Ehlers Danlos syndrome) She had multiple elastic scars on the face, brow and chin (Fig 207) Similar scars were especially striking on the extremities and involved large areas particularly on elbows knees and shins and a pseudomolluscoid tumor was present on the left knee (Fig 208) The brownish scars were thin and atrophic like cigaret paper and could be lifted several centimeters from the underlying tissues The superficially intact skin seemed generally soft but appeared normal except for decreased subcutaneous fat. The entire body surface skin showed abnormal

(1) Chirurg 26 542 545 December 1955

elasticity and lifting of skin folds was always painful. Joints of the upper and lower extremities could be extended abnormally General physical examination showed no evidence of organic disease. Bleeding and circulation time and platelet count were normal.

The present opinion is that elasticity of skin is due less to the state of elastic tissues than to the function of collagenous substance and smooth muscle bundles in the corium Increased elasticity and fragility of skin are related to



Fig 207 (above) —Abnormal elasticity of skin. Scars on brow and chin are not typical.
Fig. 208 (right) —Pseudomolluscoid tumor on left knee joint. Brown, cigaret-paper thin scars on both knees and lower legs.
(Courtesy of Dammermann, H J and Müller W Chirurg 26 542 545 December 1955.)

loss of tension and hyperextensibility of collagen fibers which can be demonstrated with the electron microscope. Similar changes of collagen in capsule and ligaments of joints has not been confirmed microscopically Subcutaneous tumors have been described histologically as fatty tissue elements with connective tissue capsule sometimes with central necrosis and calcification

In a pathologic condition due to a developmental defect of mesenchymal tissue changes in the bony skeleton might be anticipated Defects in cranial ossification anomalies defects in nasal septum radioulnar synostoses and club feet

have been observed and demonstrate weaknesses in the osseous system Generalized deficiency in the bony skeleton with disturbances in mineral metabolism have not been reported Leger described a case of mesenchymosis in a girl 17 with principal symptoms in joints and ligaments she also showed general calcium deficiency of the skeleton with striking fragility of bones though blood calcium and phosphorus levels were normal

Medical treatment has proved ineffective Subcutaneous hematoma should be treated by compression bandages which aid absorption Skin injuries are best treated by simple closure with clamps with a liquid adhesive or adhesive plaster to control gaping wound edges Habitual luxations malposition and weakness of joints require orthopedic treatment, varying with location and degree of difficulty

Indications for Operative Treatment of Tendinitis Calcarea are presented by Pehr Malm[2] (Helsinki) Calcification of tendons and ligaments is referable to constantly repeated trauma with resultant degenerative changes in the tendon tissue to which the body reacts by deposition of amorphous calcium carbonate and phosphate Calcifications may be present without producing any symptoms The symptoms tenderness on palpation pain and limitation of movement, are sometimes chronic. In tendinitis calcarea of the shoulder region a spot that is usually located toward the front between the acromion and the greater tubercle, is tender on palpation In subacute and acute forms the same symptoms are more marked and muscular spasm is present

In mild chronic and subacute tendinitis calcarea in the shoulder region with small foci of calcification x ray treatment usually yields good results In long standing cases in frequent recurrences and in patients who do not respond to x ray treatment with complete relief from symptoms surgery is indicated to eliminate atrophy and contracture in the joint region In hyperacute forms incision and evacuation of the focus is most effective The patient is usually able to work within a week

► [Calcification associated with acute bursitis can be relieved almost immediately and frequently permanently by injection of procaine washing

(2) Acta chir scandinav 109:442-448, 1955

out, aspiration or needling of the bursa and the injection of hydrocortone. Only in old chronic calcification of tendons, in which the calcium material is like crushed chalk, should surgery be carried out. Surgery is indicated if the patient is having pain which can be attributed to the calcium deposit in degenerated areas of the tendon. Experience has shown that it is not necessary to resuture the tendon fibers after excising the calcified necrotic portion of the tendon.—Ed.]

Nutritional Evaluation during Altered Physiologic State after Injury is discussed by John M Howard[3] (Baylor Univ) Most injuries include at least three components destruction of tissue loss of blood and a break in the defense against bacteria Increased excretion of potassium and nitrogen in the urine is associated with tissue destruction and appears to be due to adrenal cortical response and to increased destruction of tissue Unless renal damage is severe plasma potassium level rapidly returns to normal.

Coincidentally with potassium and nitrogen diuresis there is conservation of sodium and water The net conservation of sodium during two weeks may amount to 500-900 mEq Despite sodium retention plasma sodium concentration often falls sharply within a few hours and may remain at subnormal levels several days

Blood glucose concentration rises with injury as a result of the responses of the sympathetic nervous system and adrenal cortex. The fasting blood sugar level may remain high throughout the week after injury slowly subsiding toward the normal level During this time the glucose tolerance curve is diabetic in type The stress response being antagonistic to the effect of insulin is associated with decreased sensitivity to insulin

Changes in protein metabolism become increasingly evident during the days after injury Not only is nitrogen excretion increased but the concentration of serum proteins changes in a predictable manner After abdominal trauma there is a rapid progressive decrease in albumin-globulin ratio the ratio often falling to less than one by the third day After injuries of the extremities the changes are less marked but are qualitatively similar

Severe trauma to any part of the body may cause a sharp rise in total urinary excretion of creatinine an excretion which may reach a level of 4-6 Gm /day Similarly excretion

(3) Am. J Clin Nutrition 3 456-460 Nov Dec., 1955

of creatinine may reach a level of 3-4 Gm./day but this appears to follow injuries involving destruction of large masses of muscle.

The clotting time decreases and the platelet count and fibrinogen concentration rise after injury. This cannot be prevented by administration of vitamin K. Rather than being a pure deficiency of prothrombin it appears to be a deficiency in activity of the accelerator globulins.

The leukocytic response is often quite striking after trauma. A count of 20,000-50,000 cells/cu. mm. has often been found in a combat casualty a few hours after injury.

As a result of hepatic ischemia and of hemolysis occurring after transfusion and in hematomas rise in serum bilirubin level follows severe injury and rapid transfusion. On the day of injury and resuscitation the level may rise steadily to 2.5 mg./100 ml. Bromsulfalein retention can almost invariably be demonstrated after severe injury.

INDEX

INDEX

INDEX

INDEX TO AUTHORS